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CAPITAL REQUIREMENTS FOR ECONOMIC GROWTH

JAMES TOBIN

The road to complete business recovery and faster economic growth for the United States is not the path of tax cuts and heavy stimulus to consumption. It is built instead upon a combination of expanded public and private investment resulting in a deepening of capital investment in new plants, technologies, and productive facilities that will increase this nation's future capacity to produce. That is the new economic frontier, this authority, one of the President's advisers, states. Will we be able to cross it successfully? Probably, he thinks, but outlines some of the challenges which must be met soon, if we are to hold our own against other countries whose economies surpass us in rates of growth.

James Tobin, a member of President Kennedy's Council of Economic Advisors, is Sterling Professor of Economics at Yale University on leave. At Yale he was also Director of the Cowles Foundation for Research in Economics. He was educated at Harvard—A.B. summa cum laude in 1939 and Ph.D. in 1947, and served as lieutenant in the United States Naval Reserve in World War II.

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EXPERIENCE both in the United States and in other advanced economies strongly suggests that an increase in capital formation in the form of plant and equipment, as a percentage of Gross National Product, is prerequisite to increasing the rate of economic growth. I shall be very much concerned with this suggestion in this paper, for I am going to examine some of the problems of economic policy in regard to growth. Undoubtedly I shall raise more questions than I shall be able to answer.

The basic question is this: Is the annual rate of growth of productivity per man-hour something that can be affected by public policy? Or is it given to us by nature, and remains the same no matter what we do?

In the thirties and forties when I was a student of economics, there was a general tacit assumption that built into the system, without anyone's needing to do anything about it, and beyond anybody's power to change up or down, was a certain average annual rate of growth of productivity. It is only recently, in one of the new frontiers of economic theory and statistics, that there has been interest in looking more seriously at the sources of growth of productivity and at the possibilities of accelerating it as an objective of public policy.

What Does "Growth" Mean?

At the outset I would like to first distinguish between the several meanings of the word "growth," distinctions not always made in discussions of the subject.

It is one thing to look at how the *actual* output of the economy has grown over five years or ten, or two years, or three years (such as during the last eight years when the Gross National Product or total output of the economy grew at a rate of 2½ percent per year after allowing for price changes. This is the growth in what we would call *real* Gross National Product.)

I would like to distinguish between

that growth, and what happens to the *potential* output of the economy. I make the distinction because—unfortunately or fortunately—in a free economy we don't always use the resources of the economy—labor and capital—to the fullest. Therefore what happens to our actual output may differ from what is happening to the potential output of the economy over the same period of time. If we start at a time when we were having full employment, then look at the end point of the time period and note that we are below what the economy can do, the *actual* rate of growth as measured by output produced will be smaller than it could have been.

Now that is what happened in the past eight years referred to—1953 to 1960. During that period we would estimate (it must be an estimate because this is something one doesn't observe directly) that the economy could have grown, without special efforts to accelerate the rate, at 3½ percent instead of at the 2½ percent rate it actually achieved. The reason is that in 1960 there was an average of over 5 percent unemployment, whereas at the start of the period in 1953, average unemployment looked something like 3 percent.

We Are Below Our Potential

So, the *actual* growth of the economy was considerably less in fact, than the growth *potential*. When we talk about the problem of economic growth, I think we ought to distinguish between the growth of capacity, the potential output of the economy, and what actually happens over any short period of time. Looking at it from an opposite angle, it is possible that during recovery from a recession the output of the economy could grow very rapidly for a year or two or perhaps three. Maybe it could grow at the rate of 10 percent per year for a short period of time. But that would merely reflect a taking up of the slack and would not indicate a growth that can be sustained and kept going year after year, once the slack has disappeared.

Another way to put the problem is to distinguish between the growth of demand, and the growth of supply. We have a demand problem when demand is below capacity, below the potential of the economy. Then, if we can make demand for goods and services grow by, say, 10 percent over the coming year, it is very likely we can make real output grow by almost that amount as well. But, if we continue to make demand grow at 10 percent, obviously output in real terms cannot for very long grow that fast—we reach the limits of employment of labor and capacity to produce. The end result of keeping up the stimulation of demand after current limits of capacity have been reached is inflation.

Must Raise Productive Potential

Therefore we must make a sharp distinction between two problems—the two problems that we face today. One is recovery—taking up the economic slack and getting back on the full employment track, using once again the productive potential that we now have. The other—which is more a supply or capacity problem than a demand problem—is to increase the potential of our economy to produce.

Problem of Recovery

I am not going to make any guesses today on where we stand with respect to the first problem—recovery from the recession. It's hard enough to look back

on a recession, even two years after the upturn, and determine just when the bottom of a recession occurred. Certainly at the time this article is being written, we lack such perspective. It is very difficult to say if the real upturn has come, or when it may come.

From the rather low vantage point from which we look today, the compelling problem is the first one, the problem of recovery, of getting back to the potential that we haven't been using. It might be asked why worry about the rate of present growth or the potential output which is quite hypothetical because we're far from using it. Indeed, the growth of potential output seems already too fast from this point of view. At least superficially, it seems to increase the difficulty of our recovery and unemployment problems.

We have all noticed that month after month we are able to set new records, both in employment and unemployment. This leads some to believe that there is nothing wrong with the economy except that people are so unkind as to insist upon entering the labor force. If the labor force would remain constant instead of growing, and we could have this growth in employment, then we wouldn't have this intractable unemployment. Also, if productivity grew less fast than it does, then it would seem easier, to a superficial view, to employ the labor force that exists. We might therefore regard the 3½ percent potential growth in output, from the point of view of anti-recession policy and unemployment policy, as an embarrassment rather than as something to be prized and, if possible, to be increased.

I will return to this apparent paradox later in this article; but let me now assume that we have solved the recovery problem. As I have pointed out, solving the recovery problem is just a matter of getting more demand and more spending, which might seem to be an easy thing compared with really increasing the ability of the country to produce goods and services.

Public Policy and Growth

Right now it does not seem very easy, and we do not really regard it as an easy problem; but for purposes of my thesis let us consider a hypothetical situation, or time, which I hope is not really too hypothetical. Let us say we have taken up the slack and are back at a tolerable level of unemployment and rate of use of our capacity. Let us then ask, "What is it that determines how fast our capacity-to-produce grows; and what, if anything, can be done as a matter of public policy, to increase that rate of growth? If we are resolved as a nation to increase the rate at which the potential of our economy to produce grows over and above the 3½ percent per year that has been the average rate for the past eight years, what can we do?[11]

It is more or less a tautology or truism today that the growth of potential output depends on two things: One is the growth of the labor force itself, both in terms of the number of people who are working and the number of hours they work. We have over time something like a 1½ percent per year growth in the labor force. It may become a bit higher in the sixties because of the particular age composition of the population. Offsetting that to some extent, we have a small reduction in average hours of work as we choose to take some of the gains of productivity in leisure rather than in production of goods and services. So, the labor input, taking together the men and women employed and the hours they work,

probably grows at an average rate of about 1.2 percent per year.

Now, the other factor in the growth of potential output is an increase in productivity per man-hour. That growth in productivity is what makes up the rest of the 3½ percent rate of growth we have experienced in the past eight years. So, if you get a 1.2 percent per year increase in labor input, you can, under present circumstances, expect something like a 2.3 percent rate of increase of productivity per man-hour.

I am, of course, discussing the economy as a whole, for if one looks at particular segments of the economy or particular industries, one naturally gets a different estimate.

The economy as a whole includes labor in the government, labor in agriculture, labor in the service industries, labor in manufacturing, and everywhere. This is the grossest kind of overall average.

Growth of Labor Input

As a matter of policy we don't do much about the first of these two factors, the growth of the labor force. This depends in the last analysis on the birth rate, on people's attitudes toward retirement, toward schooling and working, toward double jobs, toward women working, and toward leisure. We could, I suppose, if we were interested in promoting goods and services as against leisure, adopt an aim in public policy to increase the work force and the hours worked. But this is not now public policy, although it might be in wartime.

Raising Labor Productivity

The main component of growth of output in which we are interested is the growth of productivity, and that is the heart of the issue. Recently, and concurrently with new developments in economic theory and statistics, there has been a re-examination of the sources of growth of productivity and, as a matter of public policy, of the possibilities of giving deliberate and planned impetus to stepping up this, the rate of growth.

Sources of Productivity Growth

It is easy to list what some of the obvious sources of growth of productivity are. One, of course, is the growth of science and technology and research and development. The second, of course, is the improvement of the general skill, training, knowledge, and education of the working population. A third factor is the increase we have had over time in capital invested per worker. Both public and private capital formation has resulted in what economists call in jargon, "deepening of capital," in that every worker has on the average more tools to work with than he had ten or twenty years ago.

Now, listing these factors should not give the impression that they ought to be regarded as separate and additive; rather, we have come increasingly to recognize the interactions among them.

One way to appreciate them is to pose the question: How much of the growth of technology and skill is "disembodied," and how much is "embodied"? I mean by that, how much of the improvement in productivity can be obtained from improved skill and improved knowledge *without* putting in new equipment, new plants and new facilities which carry with them—in fact are the vehicle of—the new techniques and the new skills?

If you have to have an investment in plant and equipment to introduce the new advances, I would refer to them as "embodied" in new capital. On the other hand, an improvement in productivity is "disembodied" if it is something one can introduce without making any investment but simply by doing things better, by better skill or new knowledge.

No doubt these are all gradations in the actual spectrum of innovations. But it is being increasingly recognized in recent research and wisdom on this subject that most advances of science and technology can only be exploited with new investments. Thus new investment has a double contribution to make to economic growth—one, just giving workers *more* tools to work with; and two, giving them *better* tools to work with.

Plowing Back Output

After listing these factors we come easily to the conclusion that if we want to accelerate growth of the nation's ability to produce, we must put more effort, more resources, more current output into these three sources of growth. When I say "more," I mean a bigger percentage of current output, not simply more dollars. Putting in more dollars will make for a bigger dollar increase in output, but that is not enough. To get a bigger percentage increase in output year after year requires putting a bigger percentage of the nation's current output into the uses that expand our capacity to produce.

This is important. I fear that some people, although they recognize that more capital is needed to grow faster, believe that this comes automatically as economy grows. As the GNP becomes bigger, you have more capital formation. Even if you continue to devote the same percentage to capital formation, you will have a larger amount of investment all the time.

It is true that this growth in GNP will itself increase the absolute amount, the dollar amount, by which output can grow from year to year. But it will not increase the percentage amount by which GNP can grow from year to year unless a bigger share of output goes into the growth-producing uses—research, education, and capital formation.

Cutting Consumption's GNP Share

If that is done, if more of our current output is devoted to education, research, science, and to the formation of capital, both public and private, then it follows there is going to be a smaller percentage available for the other uses of output. These are, of course, principally consumption—private consumption and public consumption.

The conclusion that I have come to, which I think is inescapable, is that if you want to do something in the way of public policy to increase the rate of growth, it is bound to result in a reduction in the percentage share of national output that goes into consumption. This will not mean an actual reduction in per capita consumption measured in dollars at constant prices because, of course, our ability to produce is growing all the time. And if the measures are successful, our productive ability will grow even faster.

For example, if you could increase the rate of growth from 3½ percent to 4½ percent by reducing consumption as a share of GNP, from 65 to 60 percent, then, in a few years consumption would be higher since national output

would be growing faster. Even though we still were taking only 60 percent of such GNP for consumption, consumption would still be higher than it would be if we had stayed on the lower growth path with 65 percent of the GNP going into consumption.

Investment in the Future

That is really the important question, and the question on which there is a great deal of ignorance and disagreement and uncertainty. What is the payoff to the country, in growth of output, from giving up current consumption, from reducing the share of national output that we use for current consumption purposes, and increasing the shares we use for these growth-producing purposes? What is the payoff to investment for society?

Is it 50 percent per year, or is it 20 percent per year, or is it 10 percent per year or 3 percent? A decision on an investment by any businessman would depend upon some such calculation. However, we economists must admit in all humility that we don't know the answer to this question at the moment.

I can describe what difference the payoff makes, in order to stress the importance of the question. Suppose we had as an aim of national policy—I do not suggest that we should, but suppose we did—to raise the rate of growth of productivity by two points. That would be a big rise. It grows now, let us say, a little over 2 percent per year. Let us suppose we wanted to make it grow 4 percent per year. To get an increase of this magnitude, if the payoff to social saving is something like 50 percent, would require only that we reduce the ratio of consumption to GNP from 65 percent—what it is now—to 62 percent or 63 percent. That's not a terrible price to pay.

But if the payoff to social saving is only 10 percent, instead of 50 percent per year, then, if we still wanted to make the same dramatic change in the rate of growth, we would have to reduce the ratio of consumption to total product from 65 percent down to 50 percent. We would be consuming only half the GNP and investing the rest in one way or another.

The decision we would have to make as a nation is really quite sensitive to what the payoff is. At the moment, I think that everybody is entitled to his guess. My guess is somewhere between the two extremes stated here, but I certainly do not know.

Plant and Equipment Expansion

I think there is a strong presumption, based on experience both here and abroad, that an increase in capital formation in the form of plant and equipment as a percentage of GNP is a prerequisite to increasing the rate of growth. I do not mean to say that to increase the rate of growth all that has to be done is raise the proportion of output that goes into plant and equipment. But this is an essential prerequisite.

Indeed, if one looks around the world and notes the ratios of investment to GNP in various countries, both East and West, planned and unplanned or semi-planned, the striking fact, which others have quoted many times, is that the countries that are growing fast, that have higher rates of growth in output—way above ours—are the ones that have high investment ratios, high investment expenditures in ratio to GNP. Russia, Germany, and Japan are three striking examples of countries that have both high investment rates and high growth rates in their economies at the same time.

Postwar U.S. Growth and Investment

Evidence of the same thing can be seen within the United States by comparing two postwar periods—1947–53 and the following seven years of the immediate past, 1954–60. As my occupation in the past few months has been not entirely academic, I would like to explain that the choice of these years for comparison is not governed by the political parties that happened to be in power in the two periods. During the earlier period, the rate of growth of the output of the United States, its potential output, capacity to produce, was 4½ percent, whereas in the subsequent period, from 1953 on, it has been 3½ percent.

How can this be explained? Part of the explanation is, I think, the fact there was a backlog of technology at the end of the war. Demand was concentrated on hard goods, where there were some easy victories in productivity in the earlier period.

But it is also quite striking that during the earlier postwar period the private stock of plant and equipment was growing at a rate of 5 percent a year, and per worker it was growing at a rate of 4 percent per year. Since then it has been growing on the average only 4 percent per year in aggregate, and only 3 percent per worker. It is not just coincidence that productivity per man was growing 3.2 percent per year in that earlier period, and it has grown only 1.3 percent per year in the second period.

Modernization of Equipment

As I have pointed out, it is not just a question of expansion of the stock of equipment, or even of the stock per worker. Much depends on modernization and on the newness of the equipment. An increase in productivity follows replacement of old equipment by equipment up to date in technology, whether or not the stock is expanded. What has also happened since 1953 is that the share of new plant and equipment in the outstanding stock has declined.

In 1953, 21 percent of the stock had been produced within the previous three years, while in 1960 only 18 percent of it had been produced in the last three years. Likewise, in that earlier period we were devoting 11 and 12 percent of our GNP to plant and equipment investment; whereas in the past few years the rate has been below 10, more often 8 and 9 percent.

If we want to have a faster rate of growth, one of the things we must do is to see that a higher ratio of our GNP goes into plant and equipment expenditure. I do not say that this is all that has to be done to get a higher rate of growth, but it is one thing.

Recovery versus Growth

Now, I come back to the problem of the relationship of the growth problem to the problem of recovery. I will set forth in all its nakedness a real dilemma of economic policy and economic diagnosis: As I mentioned before, and as everyone knows, we are not now at full production. We fall short now by perhaps 10 percent. We are 50 billion dollars below potential. The question has been raised by many people whether with the present tax system, we can achieve and maintain full employment.

If we had full employment right now, we would also have revenues for 1962 for the federal government of about 92 billion dollars instead of the 82 billions actually anticipated in the President's Budget. Instead of having a defi-

cit in prospect of 2.8 billion, we would have a surplus of 7 billion.

A serious question is, can there be both a surplus of that magnitude and full employment at the same time? To put the same question in another form, can the U. S. economy have full employment without having a higher consumption-to-GNP ratio than it would have under our present tax structure?

We estimate that, at full employment, under our present tax system, which would yield the estimated 92 billion in revenues for the federal government, private consumption would be about 63 percent of GNP, compared to 65 percent at present. So the question really is, can we find expenditures sufficient to fill in the other 37 percent of GNP if consumption is at only 63 percent of GNP?

The mechanism here involved is of course that the high progressive personal income tax and the other taxes which yield the high revenues of the government also act to cut down on the percentage of the GNP that people are able and willing to spend for consumption purposes. Where, then, do we get the other 37 percent if consumption is only 63 percent?

Some 20 percent of GNP goes into government purchases, goods and services—federal, state and local governments together. Probably 4 percent or so is the figure for residential housing construction, and 1 percent for the export surplus that we must have and I believe can have, in order to finance our foreign aid and capital exports.

That leaves 12 percent of full employment GNP that would have to be used by private investment in plant and equipment and in inventories. Thus the question that I have asked—whether full employment of this kind is conceivable, whether it is self-contradictory—may boil down to whether there is sufficient incentive in a full employment economy in the United States today for business firms to devote about 12 percent of GNP to plant and equipment investment and inventory accumulation.

Now in an economic recovery from recession perhaps as much as two, or even more, of that 12 percent may be in inventory accumulation. Inventory building may get you to the top of the boom, but it will not hold you there. You cannot rely on it to sustain prosperity. One of our main problems is to find some other demand to come in and take the place of inventory buildup to prevent a slideback into recession when inventory buildup runs out.

So we really must ask whether something like 11 percent of GNP can be devoted to plant and equipment investment. Can investment be sustained at that level for some time, not just for a spurt of a couple of years as in the investment boom of 1956–57? If you believe that the latent demand for investment by business firms, even under the stimulus of full capacity operation, is too weak to make up that amount of demand, then you must recognize that what you are essentially saying is that we cannot hope to have a rate of growth higher than the 3.5% mentioned at the beginning of this article. We will not be able to provide the plant and equipment investment we need to support a higher rate of growth, because the incentive and demand for such investment will not be sufficient.

On the other hand, the opposite dilemma arises if you believe that, even though the higher rate of investment demand can come forth and be sustained, is not enough to increase the rate of growth as much as desired. This would suggest that we really would like

to make the ratio of investment to GNP even higher, to increase it from 11 to 12 or 13 percent. We also have the problem that perhaps 20 percent is not enough for government, for a number of reasons: We need more government investments, and we may need more defense. Besides there is the problem that government, because it involves mainly the services of individuals and not much machinery, grows more slowly in productivity than other sectors of the economy. So if you want the same real product from the government you must increase its share of GNP. If you look at the problem from these standpoints, you may say that the problem is not that the 63 percent consumption is too low, but that it is too high.

I don't know which of these dilemmas is the real one we face, whether our problem at full employment is too much saving or too little. To ride both horses at one time, we are trying to put as much incentive for investment as possible into the tax system and into credit policy, at the same time holding back on consumption by the tax system we now have. But we still don't know whether the economy is latently capable of enough in the nature of demands for investment for a sustained period of time to give us the kind of composition of full employment output I have referred to—a composition which will yield a higher rate of growth in the capacity of the economy to produce.

In this paper I've asked more questions than I've answered. But what I have tried to do is to set forth the views we at the Council are taking of these problems, and also how economists in general look at them. We hope that from both inside and outside the government we will be getting some of the answers in the next year or so.

INDUSTRIAL CHALLENGE IN SOUTHERN ITALY- THE CASE OF THE R-T FACTORY

G. B. BOZZOLA

What happens when a simple, farming community suddenly becomes the site of a highly mechanized factory with an imported managerial force and the last word in employee comforts and production schedules is described here by the Professor of Commerce called in by a distraught management to help pick up the pieces after a bitter total strike. His observations dramatize not only the clash between two economies but ways and means by which management can make the difficult and delicate transition less painful for all concerned.

Professor Bozzola, a member of the Economics and Commerce faculty of the Catholic University in Milan, is Director of the Institute for Industrial Training in Milan, a foundation established by private industries in Northern Italy to provide organized technical assistance to management. From 1955–1956 he was chairman of the Labor Board of the National Productivity Committee in Rome. He is also the author of three books on European labor and unions published abroad. His latest deals with labor economics and industrial relations in Italy.

The R-T factory, newest branch of a large North Italian chemical-textile combine, is situated on the outskirts of a small town (population 20,000 souls) south of Naples. It employs 500 men and women and is by far the largest single employer in the community which, for centuries, has made its living from agriculture. Most of the members of its labor force still work the land for an average monthly wage of from 20,000 to 30,000 lire or $30 to $40 a month.

Here, as in the rest of southern Italy, about 25 percent of the adult population is illiterate and only 1.7 percent has attended a university. Less than one quarter of those going to college received technical training of any sort there.[1]

The town, which we shall call Civita Incognita, to prevent embarrassment which might result from the use of its proper name, has an industrial labor force of around 4,250. At the time this study was begun (three years ago),

Civita Incognita's labor force consisted of 1,350 factory workers, 200 hand laborers, and 2,700 unemployed. Five hundred of the factory workers were employed by R-T, the remainder by some 11 other firms in the chemical, wood-working and metal fabrication trades. None of these approaches R-T in size.

Until the end of World War II, there were no factories in Civita Incognita. The only workers who did not till the fields were hand artisans. In 1954 a decision was reached at the home office of R-T in highly-industrialized northern Italy, to establish a southern factory.

It was part of a government-encouraged move to industrialize the depressed areas of the South and credit and tax advantages, coupled with the prospect of access to a relatively cheap labor supply created a favorable outlook for the undertaking, part of a new *risorgimento* by means of which Italy is repairing her war-injured economy and is able to take her rightful place in the European Common Market.

A "Model" Factory Is Built

In 1955 the factory, a textile-chemical plant of medium size, was built on the outskirts of the town. It might, in some ways, be described as a "model" factory in that the building, the machines and equipment are all of the most modern type and respond almost perfectly to the requirements of modern industrial engineering. The plant is equipped with sanitary conveniences for the workers (toilets, showers, clothing lockers)—a cause of dissension and employee discontent, as we shall see later. It also has an employee lunchroom and first aid and medical services are provided by the management.

The Great Job Hunt

The last shingle had barely been nailed to the roof of the factory, when a curious ferment seized the town and every able-bodied adult, male and female, in Civita Incognita embarked on a furious Job Hunt. "Fierce" is the only proper adjective to describe their conduct. Workers came from outlying farms to line up at the employment office as did substantial citizens, even those who owned land or had permanent jobs or other income sources and could have maintained their customary standards of living without taking on a factory job.

Many of this group, perhaps because they were better furnished with recommendations and displayed greater initiative, were taken on at R-T, a circumstance which generated rivalries, conflicts, and ill feeling which, even five years later, have not died down, and from which has sprung a mental attitude and bearing in the people that is destined to continue. (Most probably this sense of injury on the part of some of the men who failed to get jobs at R-T will result in continuing unpleasant and unpredictable developments.)

Prices and Rents Soar

After a few pay days prices began to rise in local stores. Somewhat later, rents did too as workers sought living quarters close to the factory. Extravagance, a demand for luxuries, and not far behind, indebtedness followed. Within a year, as some workers found themselves unable to cope with the industrial life, there was a sharp rise in unemployment statistics.

Then there was a rapid orientation of the populace toward political parties of the Left, mostly toward the Socialist

party who were the first to sense their discontent and take the initiative in assuming the "defense" of the workers against the "bosses."

General Strike

Within two years, there was a total general strike at R-T. It lasted a long time with all personnel of the factory at laboring levels taking part. During the strike there had been an attempt to occupy the factory. Pickets paced to and fro in front of the factory gates and there were public demonstrations and mass meetings in the town, all in support of the strikers who demanded pay increases and a change in employee disciplinary regulations. The strike, which was well organized, indicating that the employees were too and had learned union tactics in a hurry, was overwhelmingly supported by the local population.

The factory management, which consisted of several executives transferred from the North and a few engineers recruited from nearby Naples, was taken completely by surprise by the strike and its bitterness. To the directors of the firm, hastily assembled in the Board room at the home office in a large industrial center in the far-off North, the strike seemed utterly incomprehensible.

What Happened? Directors Ask

They never expected or thought it possible that such organized action could be put into execution by workers who had only recently been admitted into a new industrial means of employment, and especially in surroundings such as those provided by R-T which is famous for its orderliness, discipline, and smooth functioning.

It was at this point that the author entered the picture. He was summoned from his post as Director of the Instituto per l'Addestramento nell' Industria (Industrial Training Institute) which is an industrial foundation in Milan that provides organized technical assistance to industrial enterprises and was asked by the directorate to determine the cause, or, at least the more evident and relatively simple causes of this unexpected and unforeseen strike.

By the time the strike was settled, the situation had so far deteriorated that there was only one method of getting at the facts and feelings which had provoked it and would, unless erased, create future discord. That was to conduct a series of direct interviews with the protagonists of the situation by getting them all together and interviewing them in their own surroundings and at their work positions.[2]

Management Interviewed First

The survey team went to Civita Incognita, set up headquarters in a corner of the employee lunchroom and started interviewing. Every member of the management cadre, some forty-five persons, was interviewed separately, the interviewers strictly observing the shades of protocol proper for each level.

First approached was the manager, an aloof man from the North who rarely came in contact with the workers and considered this to be a correct managerial attitude. (We learned later from worker interviews that only one or two of the company's 500 workers, male and female, had ever had the opportunity of seeing and speaking directly to the manager in the two years the R-T factory had been in existence.)

Next, we talked to his four division heads, two executives from the North and two engineers from neighboring

Naples who headed the principal divisions of the enterprise, production, plant and plant maintenance, administration, and general services. From worker interviews and our own observations we concluded that the dominant attitude of this professional managerial group was a determination to keep the workers "at a distance."

The Neapolitan managers were even more austere in this respect than their confrères from the North, a mind-set which can be attributed to that spirit of pride of caste and social difference which is strongly embedded in South Italian customs and conventions, but which, as the years go by, is beginning to crumble.

Lack of Communication

Then, we talked to the forty members of the under-management group, supervisors, section foremen, supervisors in charge of workshops. They voiced the complaints, common to undermanagers the world over, of functional defects in the organization chart, unsatisfactory criteria in the division of work and authority between divisions, insufficient authority over workers due to concentration of authority in the manager's office. They too were concerned with a lack of communication both to and from the manager and also an inability to get through to the rank and file.

At the worker level, we found this lack of communication between the laboring force and management so complete that, in our final report, we were able to assign this factor top weight as a cause of the strike. We pointed out that, until corrected, it would remain a major cause of continuing labor-management friction.

Our survey of the workers was conducted on a random sampling basis. Every precaution was taken to make sure that the sampling was truly representative. Every division in the plant was included and care was taken to assure the same distribution of interviews by age, sex, job, etc. as occurred in the population of the plant itself.

Industrial Naivete of Workers

The first thing we learned was that this was the first factory job 95 percent of the workers questioned had ever had and they were completely ignorant of the logic which governs the working of a factory—hours, internal discipline, shifts, division of work, penalties for infringement of regulations, and the hierarchical chain of command by which foreman direct workers, supervisors give orders only to foremen, etc.

Because the workers did not understand the way things are done in industry—and management had made no effort to bridge the gap from field work to machine tending through indoctrination courses, on-the-job training, and individual counseling—they were suspicious of all regulations and inclined to take each correction by a supervisor as a personal affront.

Man vs. Machine

They also displayed an unrealistic, one might say, an almost primitive attitude toward the machinery. This was expressed in several ways. Some, through association with the machines, "took on airs" and referred to themselves as "professional men," looking down upon the dirt farmers who were their neighbors. They failed to take into account the relative simplicity of their work as contrasted with the com-

plexity of the machine's contribution to the production process.

Others, overawed by the machines, concluded that the individual's capacity was not appreciated in so mechanistic an environment. These seemed to hold a positive grudge against the machines. Both, of course, were wrong and lacked perspective. Their subjective view of their jobs was out of all proportion to the actual work involved.

We found that they were unaware of the productive yield of their own particular process or department in relation to the fabrication of the completed product. Management was of the opinion that the personnel were too immature to be informed on such things as labor costs and productivity ratios, so the workers, in their ignorance, concluded that it was chiefly their labor which created the product and therefore that they, rather than management, should receive a lion's share of the profits. They were also under the impression that management's profits were far greater than they actually were on each item produced.

Exaggerated Estimates of Profits

R-T workers found the system employed in making up the pay sheet, particularly the rather complex formula for figuring production bonuses, incomprehensible. This was true of virtually every worker interviewed and, almost to a man, they concluded that the formula employed was obviously a device to constantly defraud them of their just wages. (It should be interpolated here, that such thinking is somewhat characteristic of the South Italian worker's mentality which combines in about equal parts diffidence with a fear of being defrauded and a readiness to defend himself at any provocation.)

Sought to Improve Skills

Despite their poor understanding of the productive process and factory organization, as revealed in the worker complaints detailed above, the employees of the R-T factory were also quite aware of their ignorance as industrial men and women and eager to do something about this.

They wanted explanations, they wanted opportunities for technical education, they wanted impartial and understandable standards for evaluation of their work and their adjustment to the mechanized world of the assembly line.

Both male and female employees agreed upon the necessity for an objective evaluation of the individual merits and abilities of each worker. They asked that such evaluations and the criteria upon which they were based be made public knowledge, a suggestion which the management hastily dismissed as "ill timed" and "completely unsuitable just now."

Wanted Technical Training

About 35 to 40 percent of the workers, women as well as men, expressed a strong desire to improve themselves through special technical studies. They said that one of the attractions of going to work in a factory was the chance it seemed to offer for self-improvement. Factory work and the new world it opened up to them provided an incentive for study, for specialization, for the acquisition of technical and professional knowledge.

But these aspirations remained unsatisfied at R-T. There was no valid response in the environment for the

wants and needs engendered by the industrial situation. Civita Incognita has no technical schools, not even night schools where workers may continue their education. The factory has been requested to initiate such courses, something which it cannot do immediately. It also wonders if this is a proper function of private industry, and asks why the local government does not assume this responsibility.

This, however, is a very complex problem which besets most of Southern Italy and has its roots deep in the demography and sociology of the South.[3] It cannot be solved by R-T alone, although private industry may find itself impelled to assume a portion of this responsibility as a concomitant of the industrial revolution which it has brought to the *Mezzogiorno*.

Spending Spree

The workers also complained about "inadequate" wages but further probing during the interviews revealed that this conclusion was prompted by the fact that many of them were deeply in debt, because too much credit had been extended them on the basis of their new jobs.

To many the prospect of finally being able to receive a regular salary and one of a higher level than that earned by the average local worker in their community not engaged in industry, created in the factory workers a compulsion to live above their earning power. They lacked even elementary ideas of budgeting and this, plus a trust that they would always have pay checks coming in from week to week, provoked an uncontrollable urge to run into debt.

When their creditors called for payment, the workers, finding themselves short of money, immediately concluded that they were being underpaid.[4] The result of this mental attitude with its inevitable consequences on the output of the factory, union reaction and political exploitation by the parties of the Left is easy to predict.

Scramble for "Model" Houses

R-T workers interviewed were also irritated, to put it mildly, by the fact that the company had constructed special, new houses for the managerial and clerical staffs. Traditional housing in Civita Incognita was definitely not up to the standards of the company houses.

Some additional workers' houses were built, with State aid, but the number was small and the method of assigning these few model houses to workers caused trouble. Inflamed by personal rivalries, the scramble for company houses erupted into situations bordering on violence and there was a very real possibility of outright physical danger to workers involved in such disagreements, particularly those who succeeded in getting the new houses.

Washroom Imbroglio

Another cause of discontent was, of all things, plumbing. The management had installed washrooms in the factory of a type that is commonplace in factories in the north of Italy and in big cities the world over, but they were a novelty to Civita Incognita. The luxury and efficiency of the sanitary services placed at the disposal of the workers in the R-T factory created strong discord when workers compared them with the facilities they had at home.

Virtually all of the employees lived under extremely depressed conditions in houses without baths and indoor plumbing. (Housing in this town is

sub-standard even when the average working class family house in Italy is used as a basis for comparison.)

Comparison of company washrooms and their own primitive facilities at home seemed to infuriate the workers and serve as a continuous reminder of the difference between their own personal poverty and company-owned luxury.

Foreman Trouble

Finally, the workers had "foreman trouble," the interviews revealed. While the R-T foremen had for some time complained to management that they lacked power to control the workers and that the exercise of their authority was far too limited, we got a different story from the workers.

Statistics later backed up the workers' belief that these men in fact exercised a great deal more power than did their opposite numbers in North Italian factories. There was also a vast difference between individual foremen and between departments in the amount of power they arrogated to themselves and the ways in which they used it, indicating a lack of standardized and clearly understood company policy on the subject.

"Ruling Man" Philosophy

The workers logically saw in their foreman a profile of management and this varied widely from individual to individual foreman. The situation was further complicated by the typically South Italian characteristic of being highly receptive to the "ruling man" philosophy.

Incapable, both for historic and sociological reasons, of comprehending at present a management "system," R-T workers translated their conflicts with the system into a series of personal disagreements with the "ruling man" who was their immediate boss and vice versa.

Added up, the workers' complaints revealed that they and management obviously did not speak the same language, that they did not have the same standards of industrial philosophy, nor did they share common goals. This had resulted in an atmosphere of dissatisfaction, tension, and conflict in the R-T factory which had erupted into one costly strike followed by an uneasy peace that settled few of their basic differences.

In certain aspects the situation was so bad that it completely annulled all the undeniably positive benefits which ought to have followed installation of this new plant and the industrialization of a hitherto depressed area.

Lessons To Be Learned

In microcosm, the misadventures and the misunderstandings that arose at R-T reveal something that is happening all over the world today and of which management should be aware when it seeks to locate facilities in a depressed area whether it is, as in this case, in the agricultural southland of the entrepreneur's own country, or, as conceivably might have been the situation, in a foreign country. This is perhaps the larger lesson to be learned from the case study we have presented here.

The industrial revolution came abruptly to Civita Incognita and without adequate preparation on the part of management and the community. As a result, everybody got hurt as sectional rivalries and cultural differences were emphasized and became magnified into political issues. Worse, it came in a highly accelerated form. Within two years the workers in the southern

branch of R-T went through a cycle of innocence, misunderstanding, discontent, disillusionment, and hostility to the industrial method and rationale.

A parallel might be drawn between their experiences and those of British laborers, such as the Luddites, over a century and a half ago when they left small family farms and home handcrafts to enter the cotton mills of the Midlands and put in long days operating the power-driven spinning machines, with the resulting dislocation of their personal and economic lives and, eventually, riots in which the workers attacked the machines. Then, much later, they sought legislative and political remedies for their unhappy situation.

However, the Luddites' and the neo-Luddites' conflict with industrialization and eventual adjustment to it as a way of life took some fifty years to be resolved, while the Civita Incognitans went through the full circle in less than two years.

Management's Lack of Foresight

Their experience was further complicated by politico-economic ideologies rampant in the world today. And management's experience was complicated by a clash between two cultures and those hard to answer but persistent questions which the impasse posed, such as the extent of management's responsibilities in providing education, counseling, improved living standards, etc. for an entire backward town.

Obviously, management can be charged with a lack of imagination in that it did not foresee and prepare adequately for the many vital fringe problems such an upheaval brings in its train. It failed, in some ways, to meet the industrial challenge which for Italy is inherent in the development of the South. It should also be pointed out that the workers of the *Mezzogiorno*, because of their essentially Southern characteristics, were at fault too, and slow to adapt to a new situation.

Perhaps the thought might be injected here that it is probably one of the obligations of capital pioneering in underdeveloped areas to foresee and plan solutions for these inevitable human problems at the time it draws blueprints for the factory, mine, or mill it seeks to establish. Certainly forethought and some prior planning in this regard is far less costly than a strike.

R-T's experience also pinpoints the particular problems which the Italian government and industry face in the creation of a Southern economy capable of integrating itself with that of the highly developed and industrially sophisticated North. The problem is one of specialized education, of applied sociology, and group psychology.

Although this is the hundredth anniversary of the political unification of Northern and Southern Italy, the two areas are still divergent economically and, in many respects, culturally too. Southern Italy, from the economic point of view, is frankly a "depressed area" and as such is a drag upon the European Common Market and a weak point in the integrated economic system of the *Europa dei 6*.

Affects European Common Market

This is not only vexing to Italian economists and planners, but carries political overtones of significance to the United States, inasmuch as European reconstruction and political stability cannot be considered as having been achieved so long as depressed areas such as Southern Italy exist. It is also obvious that no governmental un-

dertaking, no matter how large, can reorganize the economy of the South. That is a job which must be left to private enterprise.

Government, however, does have a role to play in this transformation. It can help create a favorable climate in which private enterprise, which must build the factories and provide the jobs, can establish itself without repeating the mistakes and costly errors of the R-T factory's experience.

Worker Education Vital

One of the best ways it can do this is through education. Facilities for training technicians and managers in Southern Italy would avoid importing managerial talent from the North as R-T did. Such schools would be attended by the cream of the South Italian laboring force—men already familiar with the attitudes and customs of the people native to this region; men who would instinctively avoid the aloofness and uncommunicativeness which proved so costly to the R-T management.

And, since communication like production is very much a two-way street, the men from the South, once trained in technical know-how, may also be able to add improvements and adaptations to the new facilities brought to their home communities and thus pay for their training in other ways.

Government Aid

Much good work has been done by the Italian government in this respect. Recent additional financing for the *Cassa del Mezzogiorno* (Southern Fund) has provided substantial amounts for the training of professional management personnel, but so much more remains to be done.

The Southern Fund, or to give its complete name, Cassa per le opere straordinairie di publico interesse nell'Italia Meridionale (Fund for Interventions of Public Interest in Southern Italy) was created in 1950 to work with the Ministries most directly interested in public spending in the southern regions of Italy and also with local administrative authorities charged with similar responsibilities.

Its broad function was to administer an extra push to the South Italian economy in an effort to put its industrialization and improved economic program over the top.

Creation of this body was an act of political courage, inasmuch as the Cassa was a completely new organism, endowed with extraordinary powers and a government mandate to get the job done in a hurry. It was assigned an initial budget roughly equal to one percent of the national income. The amount was $2,073,600,000 (1280 milliard lire) and the fund was to be spent over the 12-year period 1950–1962.

The "Cassa"

In 1957 the fund was increased by law to $3,304,800,000 (2040 milliard lire) and the expiration date of the project advanced to 1965. From its resources, the Cassa has already spent upward of $4,860,000 (3 milliard lire) on industrial and professional training for executives, foremen and leadermen, but the supply of Cassa-trained men is far short of the number of managerial jobs open in South Italian factories at present.

The economic development of the South may be held back because of this lack, for it is extremely difficult now to lure North Italian executives to the *Mezzogiorno* to direct new enterprises there. All too many of them remember the bitter experiences of their colleagues when they consented

to "emigrate" to work in the southern branch of R-T.

Industrial Adaptation

While the situation at the R-T factory may not be typical of the state of industry in South Italy in every particular, it is common knowledge that it represents a situation which occurs—shall we say—quite frequently in new industrial undertakings in the South. Their hectic experience obviously underscores the necessity for management, seeking to set up facilities in the South, to familiarize itself with the way in which the residents of this underdeveloped area interpret the new economic phenomena brought about by the industrialization of their home towns.

It carries with it the broader implication that new enterprises finding themselves in similar situations in any backward area must think of themselves not only as centers of business and production but as cultural centers for the shaping and orientation of people who are facing the delicate and difficult passage from agricultural and artisan activity, as well as chronic unemployment, to the industrial way of life.

The objection can be raised—it often is in Italy—that these are not problems pertaining to the economy or to company administration, but rather that they belong in the realm of sociology, psychology and politics and, as such, should be handled by the State. In any case, they continue, such annoyances are mere marginal problems and not to be taken too seriously.

In the view of the author, this is extremely dangerous reasoning. The lesson of the R-T factory's painful experience is plain. The success of a new industrial enterprise in Civita Incognita or any depressed, backward area, regardless of location, depends upon the cooperation of the local population.

It rests not on inducements offered to capital such as attractive credit and tax facilities and access to relatively cheap labor supply, but on the new firm's ability to effectively insert itself into the local environment and on the creation of social conditions within that environment that are favorable to the introduction of modern machinery and industrial methods.

REFERENCES

1. Italian General Census of 1951 including periodic readjustments published by the Central Bureau of Statistics.

2. The survey was carried out by the Instituto per l'Addestramento nell' Industria under the direction of the author. It took approximately four months to conduct the interviews in the factory and community and tabulate the raw data. Then followed a rigorous cross check and presentation of the findings with our interpretation of them and recommendations for the future to the R-T factory management in Civita Incognita.

The interviews were based on an oral questionnaire designed to cover the following areas: (1) Morale of workers in the working atmosphere. (2) The flow of command and company discipline. (3) Professional capacity and the grade of operating knowledge of the workers. (4) Influence and activities of the *Commissione Interna* which might be roughly translated as a shop committee. Elected annually by the employees from a slate of candidates proposed by the unions represented in the plant, it is the organ which represents the workers in negotiations with management on questions dealing with the application of labor laws, employment contracts, internal discipline and certain phases of personnel administration. In some respects the unions are able to influence the actual

functioning of the *Commissione Interna* within a plant. (For details see M. F. Neufield's *Labor Unions and National Politics in Italian Industrial Plants* (Cornell International Industrial and Labor Relations Report [Ithaca, N. Y., Cornell University, 1954].) (5) Communications between the personnel and the management. (6) Treatment given to the workers in assistance and recreation.

The fact that this investigation was carried out three years ago does not in any way, in the author's opinion, affect the validity of the results obtained nor their timeliness, for our findings correspond quite precisely to situations still existing.

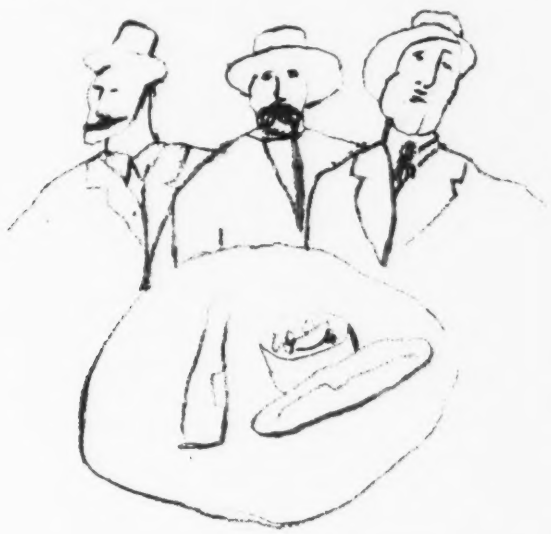
3. Both the General Census of 1951 and the later periodic findings of the Central Bureau of Statistics (See note 1.) and other authoritative bodies have established documentary proof of cultural and professional inferiority in the South.

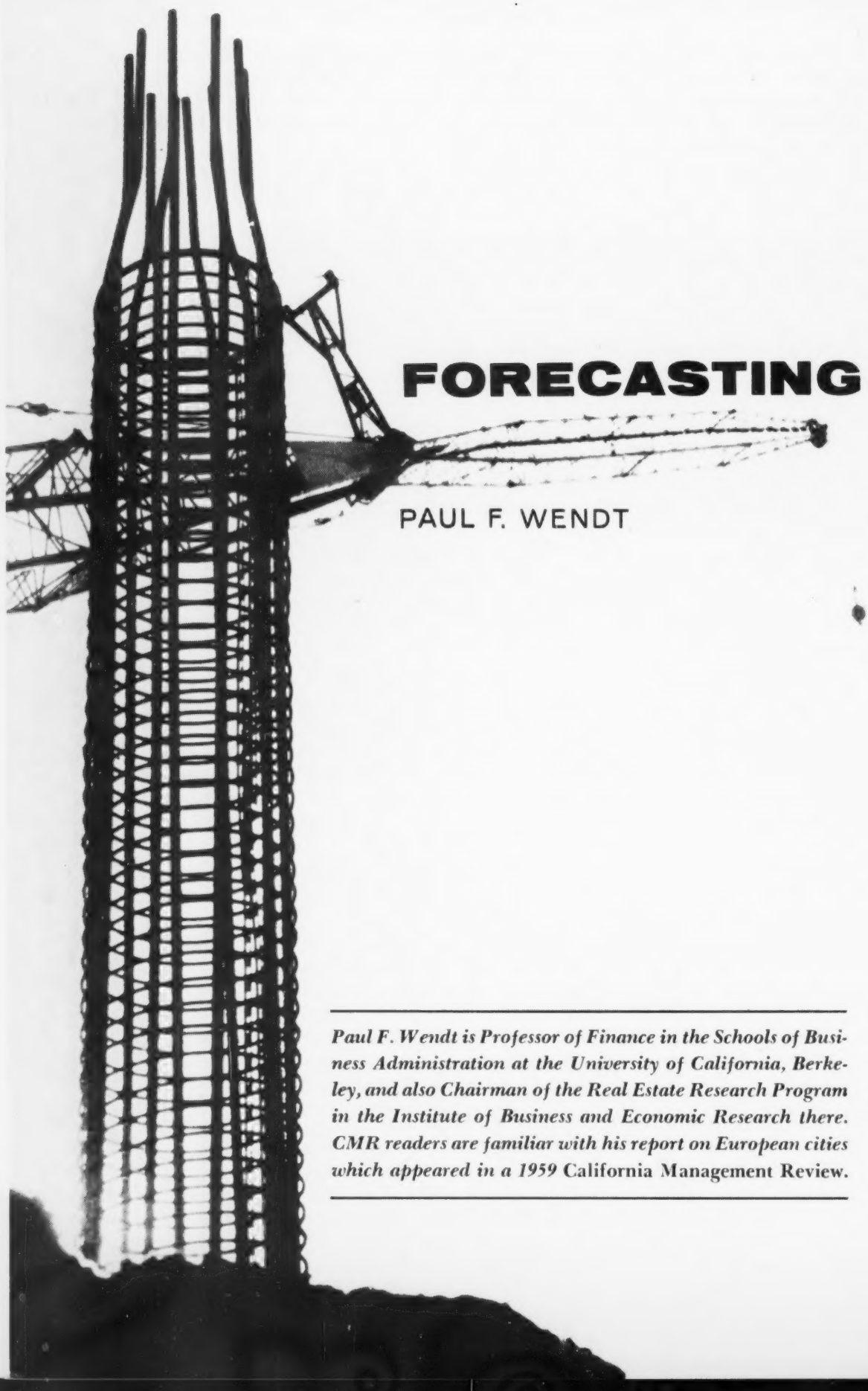
A typical example is the opinion delivered in February, 1958 at a national convention on political and economic matters staged in Rome by the Confederation of Italian Labor Unions (CISL) by Professor G. Di Nardi of Rome University.

He said: "Our diagnosis [of the predicament of Southern Italy] generally dwells on the premise that there is only one factor lacking, and that being capital, but it is becoming ever more evident that the factors which really limit our development are more than one; and in fact are multiple. . . . We could quite easily turn the situation upside down and say that the factor which is, in fact, really lacking is the man himself; not man in the numerical sense, . . . but man in terms of the various qualifications which enter into efficient productive combinations."

Professor Di Nardi, in the same speech, also criticized bureaucratic red tape which discourages new undertakings, especially in the South. He said in part: "The citizen [and he was referring to the citizen of Southern Italy] who works within the . . . economy moves within a jungle of administrative procedure which puts him at the mercy of every public official."

4. Further confirmation of this preoccupying effect of the new industrial employment has been given by another survey carried out by "Doxa" Research Institute, in a very small township in Calabria where an industrial factory has been opened up. Also here it has been found that the increase of income deriving from employment in the factory, has created an immediate need for money availability, which assumes proportions double that actually earned by the workers.





FORECASTING M

PAUL F. WENDT

Paul F. Wendt is Professor of Finance in the Schools of Business Administration at the University of California, Berkeley, and also Chairman of the Real Estate Research Program in the Institute of Business and Economic Research there. CMR readers are familiar with his report on European cities which appeared in a 1959 California Management Review.

There is a pattern to urban growth which makes it possible to forecast booms in industrial areas and spot high rent residential areas in the making. Underlying principles are topography, transportation, and the uneasy dynamics of the high income class seeking better, more exclusive residential sites. Time maps, sector analyses, input-output forecasts are tools used to predict change in the megalopolis.

METROPOLITAN GROWTH

The informed businessman is increasingly concerned with the urban-metropolitan environment within which he operates. Today metropolitan areas account for about 63 percent and by 1970 are expected to account for 70 percent of the population and working force. It has been estimated that three quarters of the Gross National Product will be produced in metropolitan areas by 1970.

It is therefore essential for leaders in business and public life to be able to forecast accurately and well in advance of their actual occurrence probable patterns of population growth and land developments.

It should be stated at the outset that forecasting the future metropolitan growth of an area presents a difficult problem and one that can be viewed as dual in nature. First, how much growth will occur in a given area? Second, what will be the effect of this predicted growth upon the various segments of a metropolitan area—upon its land uses, upon its structure of values, and upon the development that will take place?

My objectives in this paper are to review the traditional approaches to this dual problem, referring to the San Francisco Bay Area as an example, and then—perhaps more importantly—to describe some of the new techniques and approaches toward this problem which are in the research assembly lines today.

Traditional Methods Inadequate

Traditional techniques for forecasting metropolitan growth have very serious shortcomings, but, as we shall see, it is far easier to point out the shortcomings of the old than to present sound and operationally feasible alternatives.

The earliest techniques used were simple extrapolations of past population growth. One of the early writers in the field of real estate valuation, Frederick M. Babcock, advised that in the absence of any assumptions that seemed justified to the contrary, the analyst should assume that past urban growth rates will continue. Obviously, this is a very simple technique—misleadingly simple—and has real shortcomings.

A later modification of this tech-

nique is based upon the assumption that local population in an area will bear some constant ratio to the national population. This simple technique is attractive to many because it is easy to assume that a lot of able and farseeing Washington population forecasters are not going to be too far off in their estimates. Frequently, therefore, local population forecasters take some ratio which present local population bears to a national estimate and forecast urban or metropolitan population in the future on that basis.

Economic Base Analysis

Many of these early techniques have been substantially improved and sharpened in the past decade in the mortgage loan and real estate appraisal fields through what is known as *economic base analysis*. In this technique it is assumed that a local area is dependent for its growth upon the development of activities which will bring outside revenues to the community itself.

Readers may recognize this as being related to the principles of mercantilism in international trade. Many terms have been applied to the activities which bring revenues to a local area. They are variously called basic activities, export industries, town-builder activities, or primary employment. These activities are thought to be the economic base upon which a community grows, and the assumption has always been that as basic or primary employment expands, it will itself attract related "secondary" or "service" employment.

The concept of the economic base and its forecasting has led to the development of the so-called "basic-service ratio." This ratio assumes that, for every person in basic employment, there will be one or more persons in service employment—that is, shining the worker's shoes, delivering his newspaper, cutting his hair, ministering to his health and recreational needs, etc.

One of the great difficulties with the use of the economic base technique in forecasting future population is that the "basic-service ratio" may vary between areas and within the same area over time. To add to the difficulty, opinions may differ widely as to the "basic-service ratio" in the same area at the same time.

How It Works

Some of the population forecasts which have been made in the San Francisco Bay Area—I am referring particularly to the Bay Area Rapid Transit study in 1954—have relied heavily upon the economic base technique. A ratio of one person in basic employment to two in service employment was assumed for that area. On this basis it was forecast that the future total volume of employment would increase from something like 1.1 million in 1954 to about 1.5 to 1.8 million by 1970. The economic base technique was supplemented by a projection of population growth based upon assumed changes in the birth rate and upon an assumed level of future in-migration.

Estimation of the latter is a most difficult and hazardous process, since over 50 percent of the increment in population in the past seven decades in the San Francisco Bay Area has come as a result of in-migration. Many of our colleagues at the University have given study to this process to endeavor to learn how much of this in-migration is attributable to a push from the farm or depressed areas and how much results from the pull of employ-

ment opportunities or climatic factors.

We do not know the answer to these questions and therefore it is very difficult to foresee the level of in-migration that might take place and hence the future population. In this connection, studies of the Pacific Telephone and Telegraph Company have shown a very close correlation between the levels of total employment in the Bay Area and population in-migration.

It is still not clear, however, whether population comes seeking the jobs or whether the presence of population creates the job opportunities. Undoubtedly, both of these forces are at work simultaneously.

The U.S. Department of Commerce, in cooperation with the Corps of Engineers, published a study recently in which three methods were used in forecasting future growth. *First*, they applied the percentage of the estimated San Francisco Bay Area population to that of the nation and on that basis forecast that the population of the San Francisco Bay Area equaled 3.6 million in 1960. It is a bit unfortunate that they assumed 1960 as the base year, a year before the Census results were published, since these results showed that the 1960 estimate was subject to a considerable margin of error. Based on the same technique, they forecast Bay Area population in 1990 at 7.4 million, and for the year 2020 their estimate was 14.4 million persons.

Area Density Method

A second method used has the intriguing title of area density method. In effect, this method suggests that an urban community will experience some sort of a cumulative increasing rate of population growth, so that an area will go through a period of two decades of slow growth followed by two decades of gradual and then by three decades of rapid growth.

This was referred to in the Department of Commerce report as a normal sequence of growth, and it was used with some adjustments to forecast the distribution of future population within the San Francisco Bay Area. As will be seen later, this method is based upon the principle of continuity in urban growth.

These two methods of estimation were supplemented by the use of the economic base method described earlier, in which future employment in basic and service industries was extrapolated into the future.

Forecasts Have Their Limits

The techniques described provided the basis for a projection which has been widely discussed in the San Francisco Bay Area. I am sure that the authors of this report would agree with me that there are very severe limitations upon such forecasts of future growth, particularly when one undertakes to estimate not only the total future population but also the distribution of that population by locality.

These limitations are probably apparent to many. Certainly, we can expect changes in technology and productivity and resulting patterns of employment. A few years ago a panel of development experts from The Urban Land Institute were endeavoring to estimate how much land would be needed for industry in southern Alameda County in 1970, and asked me to furnish them with one very simple figure—the number of employees per acre which would be required in 1970 by industries locating in Alameda County.

Several basic questions came to

mind in answering this inquiry.—What types of industries will locate in the area? Will they require large or small land areas? Will the same number of employees be needed in industries presently locating in these areas or will changing technology and productivity alter these relationships?

Assuming that one were able to forecast the volume of basic industrial employment for some date in the future, it would next be necessary to ask the same sort of questions regarding future service employment. To what extent will changes in communication, transportation, and marketing techniques alter the basic-service ratio for the future? These developments will be of key importance in influencing not only the future volume of service employment but also the geographical distribution of employment patterns.

It is of interest to review some recent writings of population experts in evaluating San Francisco Bay Area population forecasts. Astonishingly enough, some demographers are still trying to explain the great population upsurge of the post-World War II period. Looking ahead to a great increase in the national income, they are asking what is going to happen to the future birth and mortality rates and how a rising standard of living will affect future family size and structure. It is necessary to be able to answer some of these underlying questions if one is to evaluate estimates such as those referred to in preceding paragraphs.

Are All Cities Alike?

One of the assumptions that seems to underlie most forecasts is that San Francisco is emerging as an industrial area and that it will become more and more like Chicago, New York, or Philadelphia in its employment pattern. Is this a logical assumption? Or is San Francisco representative of a new type of metropolitan area which might have a considerable amount of individuality, with a wholly different industrial pattern of growth than these older industrial areas?

Limitations upon assumptions underlying estimates of industrial structure, employment, and population provide ample reasons for questioning the unqualified use of any long-term estimates of metropolitan growth. The difficulties of forecasting future land use patterns are even more imposing.

Principles of Metropolitan Growth

The principles which are used to guide us in forecasting how urban areas tend to grow and how activities will be distributed in such growing areas were developed in the trolley-car era of city growth, and must necessarily be used with caution.

Very briefly, these principles of urban growth emphasize the importance of three significant elements—topography, transportation, and something I refer to as a principle of continuity. I regard these as sound, underlying principles upon which one can anticipate the form and shape of future metropolitan growth.

Sector Analysis

The so-called "sector" theory of urban growth has been developed from these principles. An urban area is viewed as a growing, living, dying, and constantly changing organism with the processes of decay going on at the center, with expansion from within and accretion at the edges, in an ever-outward movement.

In this constantly changing process, the residential, particularly the high-

rent residential areas, occupy a prominent place. These are the most dynamic group—those who can afford to move. The sector theory holds that the high-rent residential area will move outward constantly, along the main lines of transportation, to the high ground, and to the open country.

High-Rent Group Sets Pattern

The theory is based upon an underlying principle that many of my colleagues frown upon—that people are snobbish! I am not willing to reject the principle, however, because of their objection to it on philosophical grounds. According to the theory, middle-income groups and high-income commercial and office building development will tend to follow the direction of movement of the high-rent residential areas (not because they are snobbish, I suppose, but because they want the business).

Continuity

Turning to the principle of continuity, we find that once this movement has begun, there is a tendency for continuity—a tendency for this accretion to go on and on. Of course, as the commercial area follows the residential areas, it tends to make these areas less desirable as residential areas. This, together with the ravages of time, brings about the so-called deteriorated or "grey" areas. The process operates with pressure from business areas within the city and with accretion from the periphery pushing outward.

Influence of Topography

In this theory, industrial uses occupy the low lands along waterfronts and railroad rights-of-way, with low-rent residential areas in close proximity.

Manifestations of these principles of urban growth can be observed in the Bay Area. The influence of topography is first of all evident in the fact that the principal transportation routes are and have been established in a north and south direction for many decades. The influence of topography is again evident in the movements of the high-rent residential districts continuously toward the high ground and the open country.

Similarly, if one looks at the patterns of Bay Area industrial expansion, their movement through the low land along water, rail, and freeway transportation routes can be seen in the East Bay, San Jose, and Peninsula Areas.

Growth Maps

The linkage between middle- and lower-income housing and subdivision activity and industrial development is also clear in these same areas. Time maps showing how the Bay Area has grown over the past half century would present more clearly the force of these basic principles of topography and transportation and would illustrate the continuity of growth patterns over many years.

Public decisions, of course, occupy a key role in determining urban growth. Transportation routes and methods have changed and will continue to change substantially, and the availability of water, drainage, and sewage facilities is of critical importance. Thus, public decisions with respect to transportation and other public facilities influence future urban growth and structure. As the role of public investment in the metropolitan economy becomes larger, its impact upon patterns of metropolitan growth increases.

The great postwar outward expansion of urban areas, nurtured by the growing use of auto transportation, has

made the application of the traditional sector analysis to present metropolitan areas increasingly difficult. The geographical unit for analysis of urban growth has expanded from the municipality to include groups of cities linked together geographically, and it promises to encompass metropolitan areas and even regions, as larger urban areas become more closely linked together.

High-rent residential sectors or industrial districts radiating from an urban core become merged and sometimes lost in larger regional patterns of urbanization which emerge. These problems have made the "sector" theory considerably less than ideal as a basis for operational decisions by public and private investors, although its basic principles remain highly useful as a basis for analyzing past and predicting probable future growth trends. In the light of these shortcomings, let us survey efforts recently made to improve upon traditional analytical techniques in this field.

Time Maps

Because businessmen, public officials, and others are making "horseback" guesses today on the basis of unsatisfactory theories and forecasts, major research efforts have been directed toward the field of urban growth and development over the past decade. As a background to present research, we at the University of California, Berkeley have developed time maps showing Bay Area land uses in 1900, 1910, 1920, and 1950 and undertaken studies of the distribution of industrial production and wholesale and retail trade on those dates.

Specific studies of trends in the location of corporate administrative offices have been carried out to determine the degree to which this type of activity is subject to decentralization. Meanwhile, others have directed research efforts to the core of our cities, among them, Dr. A. H. Schaaf, who has recently published a study on the economics of rehabilitation, and Dr. Wallace Smith who is currently endeavoring to develop a model of the housing market and its filtering process.

Input-Output Method

Professor Roland Artle, formerly of the Stockholm School of Economics, has been engaged at Berkeley in reexamining the theory and techniques of economic base forecasting in an attempt to develop more useful and operational forecasting tools. He is working on the premise that it is hardly meaningful any longer to speak about the economic base of a community, since the economic life of large American metropolitan areas has become highly differentiated and interwoven with the economy of other metropolitan areas in the nation. In that sense, he argues that every activity in the metropolitan area becomes part of its economic base because it generates income.

The technique used by Dr. Artle in describing the interrelationships among different regions, metropolitan areas, and industries within a metropolitan area is called the input-output method. Through this technique, one can assume a given input, let us say a capital investment of $1 billion in a new steel plant, and explain then what the impact is likely to be on all the other industries in an area.

This method is a most powerful and useful instrument for comprehending the relationships among metropolitan areas and the various activities within these areas. Dr. Artle has had previous

experience in the application of the input-output technique—it has been widely employed in the past decade—and is presently engaged in developing a modification of the technique for portraying the intra-and inter-regional relationships of the San Francisco Bay Area. Because of its distinctive economic structure, more attention will be devoted to the household and trade and service sectors in the Bay Area.

Hopefully, this technique may permit us to answer such questions as the following: What is likely to be the effect on San Francisco Bay Area employment and incomes of a decline in employment in Los Angeles? What will be the influence upon patterns of employment and income of changes in population or spending habits or of greatly improved terms in the home mortgage market?

How Big Can a City Grow?

In analyzing the repercussions of intra- and inter-regional economic developments within the metropolitan economy, attention will be given to the constraints or limitations upon metropolitan growth in the form of transportation and communication facilities. To the extent that it proves feasible, consideration will also be given to limitations upon the supply of pure air, water, and public services. Dr. Artle holds the view that these constraints have a very important role in any prognostications made about future metropolitan growth.

A companion study moves toward the analysis of the distribution of activities in a metropolitan area. Assuming a certain rate of growth may be forecast based upon the techniques evolved from the study described above, how will the new economic activities be located in a metropolitan area?

Dr. Jack Lessinger of the Real Estate Research Program has developed three important concepts which he is employing in developing an analytical framework. The first is the concept of land markets. Lessinger has identified 17 such land markets within the San Francisco metropolitan area, using topographical and market considerations, supplemented by *ad hoc* judgments in their identification. Each land market represents an area which has a core of business development and open space around it and is viewed as a competitive unit in a system or universe.

Lessinger refers to a second basic concept in his analysis, that of continuity or accretion, which I mentioned earlier. The idea behind this concept is that growth once started in a land market will tend to continue over time as the market expands outward.

Multiple Accessibility

The third concept is based upon classification of land in terms of its capacity to support different types of activities. Land in each land market is classified in terms of its slope, load-bearing capacity, adaptability, and, most important, its accessibility to other areas. It is a concept of multiple accessibility, based upon the idea that many individuals and firms may consider it important to be accessible to a number of different employment centers or land markets.

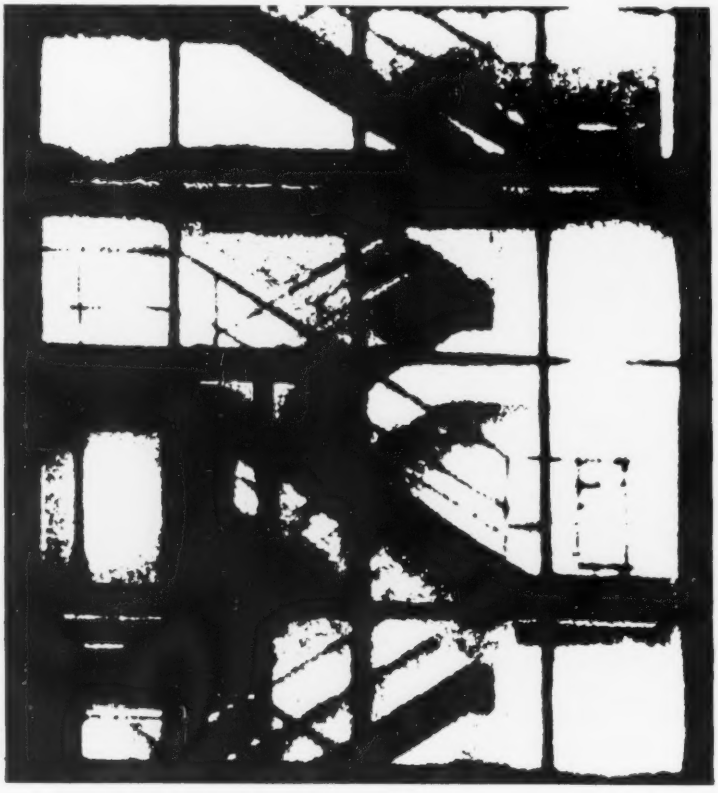
Freeways and Public Policy

Dr. Lessinger is at present endeavoring to show how these principles of continuity, capacity, and accessibility operate within the competitive system of metropolitan land markets to guide

urban patterns of development. Particular attention is given to the manner in which freeway developments alter accessibility and hence the competitive equilibrium among various land markets for land uses and development. This analysis, as might be expected, focuses attention upon the growing importance of public investment in freeways and other public facilities as influences upon metropolitan growth.

Improvements in methods of forecasting the future economic and physical growth of metropolitan areas are of critical importance, since present techniques are little more than informed guesses, based upon inadequate theories and incomplete data. Although we shall never achieve a high degree of accuracy in this area of forecasting, it is hoped that research on the assembly lines may provide a new conceptual framework in which underlying assumptions will be mutually consistent and explicit and in which more complete data may be employed in combination with the newest analytical and research techniques. Hopefully, this research may make possible more adequate forecasts of future metropolitan economic growth and of the distribution of that growth.

It is apparent to all of us that the market processes for allocation of land uses in our rapidly growing metropolitan areas must be improved. This improvement, in my judgment, will require strong research guidance, in order that both public and private investment in the decades ahead can improve the rationality of land use and the living environment in our metropolitan areas.



SERVICE CENTER FOR DATA PROCESSING FOR THE BUSINESS COMMUNITY

JOSEPH W. FISCHBACH

EDP, born of military necessity, is now controlling inventories, making marketing decisions, performing Operations Research, keeping books for banks, and making up countless payrolls not only for large firms who have their own computers, but, in some communities on a contract basis for small business too.

The first Service Center for Electronic Data Processing was strictly military in function. Installed at the Ballistic Research Center in Aberdeen, Maryland in 1947, it was designed to prepare bombing tables for the United States Air Force and firing tables for the Army. During World War II the Ordnance Department, responsible for preparing such tables, had found that it could not keep up with the demand for these calculations using manual and conventional tabulating techniques.

Joseph W. Fischbach, who took his doctor's degree in Engineering Science at New York University, specializes in applications of electronic data processing to business problems. He began with ENIAC in 1952 when he was appointed Chief of the Analysis and Computation Branch at Ballistics Research Laboratories, has been an Associate Member of the firm of Booz, Allen & Hamilton, and in 1959 became president of his own firm of management consultants, Fischbach, McCoach & Associates, Inc.

Accordingly, a contract was made with the Moore School of Electrical Engineering at the University of Pennsylvania for the design and construction of an all-electronic digital computer. ENIAC (Electronic Numerical Integrator and Computer) was the result and became the heart and soul of the Ballistics Research Center.

ENIAC

ENIAC was a giant in physical size, but with a midget brain having a memory of only 20 words, each having ten digits and a sign. There were over twenty thousand vacuum tubes used in conventional circuits to provide vacuum tube memory and control. As delivered, there was no code, and the machine was literally plugged together for the running of each problem. It should be added that ENIAC's 20 words were used for the functions of storage, control, and arithmetic operation.

Early use of the ENIAC was restricted to high priority problems and, as the set-up time was extremely high, it was very difficult to obtain time on the machine. With the help of Professor John Von Neumann of the Institute of Advanced Study, a code was developed which made the machine a general purpose computer and reduced set-up time.

The Ballistics Research Laboratories center at Aberdeen grew in response to the demand for computing services which were mostly for work on scientific problems under government sponsorship. By 1952 six computing machines were in operation and the center was probably the largest in the world.

Between 1952 and 1954 it was my pleasure to serve as Chief of the Analysis and Computation Branch of the laboratories. It may be mentioned with some fondness that the Bell Relay Calculators were part of the center and ran evenings and weekends on automatic mode, completely unattended.

The early service centers were true centers from an operating point of view but because of military practices, their scope was generally limited to scientific type problems. Today, there are available many electronic data processing service centers for general business problems and many significant applications have been programed and are now running on computers.

EDP Centers for Business

This paper is generally concerned with business type centers without any restriction. This means that all types of problems and applications are included within the scope of processing.

Many companies carry through a feasibility study as the prelude to deciding in which direction to move with regard to electronic data processing. Prior to 1959, the usual practice was to study a company's operation and costs, calculate the costs of EDP and required running time, and come to a decision as to whether there was an EDP application or not.

It was then recognized that a decision to go ahead with EDP implied in fact that a company was satisfied with setting up a data processing center of its own, generally leased for one shift, if the feasibility study indicated at least a dollar breakeven by displacing costs on the routine bread and butter operations.

During 1959, two new dimensions were added. The first related to an expansion of thinking away from requiring a breakeven of the dollar cost of processing the bread and butter appli-

cation. Instead, emphasis shifted to ways and means by which a computer system could be a source of added profit by carrying out marketing research, making possible improved strategies for distribution, as well as sharper management decisions through better management information systems. The second was the acceptance that an outside service center could do the continuous business processing for one, two, or as many hours a day as were needed.

Three Types of Centers

There are three basic forms of service center operation; namely, a company-operated center, a manufacturer's center, and an independently operated center. An example of each follows:

- The company operated center means that a computer has been installed to process the work of a particular company. The computer director reports to company management. There exist literally thousands of such centers, many of them as additions to the tabulating room.
- The manufacturer's center refers to installations established for the purpose of program testing and debugging as well as backup for company owned centers. In addition, "one-shot" problems may be solved for customers, and, in some cases, data processing is carried out on contract to perform daily processing of business problems. In the New York City area service centers are maintained by International Business Machines Corp., Minneapolis Honeywell Regulator Co., National Cash Register Co., Radio Corporation of America, and Remington Rand Univac Division.

  Installations for these and other vendors may also be found in other cities in the nation.
- The independently operated center refers to an installation which is established to provide services to a select number of sponsors, or to the business community served locally. An example of the service center concept is the SPAN operation, which was set up by four insurance companies in 1955. Other examples are the Services provided by the Automated Accounting Center of Connecticut, CEIR of Washington, D.C., and The Data Processing Corporation of America.

Of the three types of centers mentioned, we shall discuss the first and third only. Historically, the company-owned service center represents a service usually offered by the Budget Officer, the Treasurer or the Comptroller to a set of segmented functions such as sales, accounting, production, merchandising, engineering, etc.

By examining the total segmented workload of a company, it has been possible in many cases to justify economically the use of a computer. Such justification can be found despite the fact that the real cost of handling information is hardly ever known in a precise manner. Processing cost information is buried in sales, production, and the figures of other functional departments.

Considering the present stage of development in the application of electronic data processing to business, we would expect to find the expansion of processing activities of the company-owned service center to continue as more and more services are made available to the segmented functions of the company. And, as the concepts

being advanced by operations research people shake down to practical "models," a company-owned center has the opportunity of maturing into a full-fledged information system, provided it is skillfully managed by men with vision who have the freedom to develop the proper approach. We expect this process to show increasing acceleration in the next three to five years.

Where a feasibility study indicates clearly that a company proceed with an electronic program, it is important to determine next whether to proceed on a centralized or a decentralized basis.

Of paramount importance in the decision to set up centralized data processing are specific company requirements with regard to the following: management control, cost, priority of processing, scheduling, confidential nature of source documents, deadlines, demands for file or record interrogation, geographical location of center, nature of what is processed, responsibility for and effect of processing errors, general company policy, valid non-technical criteria, and irrational criteria.

Centralized Data Processing

Although centralized data processing usually means some kind of operations center, it does not necessarily mean one large computer. Within the present-day meaning of these terms, there may be several medium or small scale computers, and these may even be geographically separated. Consequently, the presence of one company computer, serving the different segmented functions quite independently, is a good example of decentralized processing. Hence, the question of centralization becomes one of the concepts inherent in the integration of the processing of related functions, treated in such a way that overall company needs are considered first and foremost.

Leasing Computer Time

Service leasing plans have many attractive features; among these is the possibility of lower hourly rates for the company being serviced. The manufacturer's or independent service center can operate its equipment 24 hours a day and on weekends, thus making efficient use of high speed equipment and taking advantage of the fact that the second and third shifts cost only 40% of prime shift rental. These dollar savings are spread out and passed on. Other advantages include the opportunity to develop reports and controls not otherwise possible for small companies and to use the same tools and techniques as are available at company-operated centers of large competitors.

Not all service centers, however, fall in the categories just discussed and additional hybrids can be expected to develop. One example is the manufacturer's service center which is made possible by the manufacturer's buy-back of excess time on a machine belonging to a client. Another is the company-owned center which rents out its extra time to other business.

Most service centers are staffed to provide a complete data processing service for the user from systems design through machine operation. A different concept, however, is practiced by IBM through its Data Centers, where the equipment available must be operated by members of the customer's own EDP staff.

The fact that a company appears to

justify a computer does not mean that it will necessarily desire to set up its own center. The reasons for this attitude are varied but generally include the following: a desire to concentrate on research and "model building," rather than on data processing; it may want quick access to scientific personnel and EDP specialists; the company may be concerned with significant internal policy problems that require prior clarification and thus is not "ready"; it may be concerned with technical limitations of available systems; and it may be concerned with conversion costs because of a bind for capital.

Spreading the Cost

A service center may be the ideal solution for a company which determines that EDP is not otherwise economically feasible. Perhaps a company may be too small for a company operated EDP center. For instance, the processing operations may be performed relatively simply by manual methods and by the use of punched cards. Hence, the set-up costs for EDP would far exceed the advantages to be gained.

Or a company which can prove the desirability of EDP for a few hours a day or a week, may obtain the advantages of such processing at an independent service center without investing in equipment of its own.

In addition, an independent service center could provide personalized services which would be attractive to many companies. In order to furnish services on a community basis to local business, the independent service center could provide personalized services to suit each participating company.

What a Good Center Can Do

The hallmarks of a personalized service would conceivably embrace the following areas:

The work processed would include normal daily routines. A major consideration in the establishment of an independent computer service center is that it be equipped to process a variety of business problems of broad scope. Included would be data used in daily business routines, with minor restriction on services to special business or scientific problems.

Data processing would be regularly scheduled. In order to provide an orderly service to those customers whose data processing assignments include routine "bread and butter" applications, the center would schedule the processing of data on both a regular and a priority basis. This would in turn enable the customer to schedule his feed of information to the center and to have confidence that the center would provide assistance during emergencies. Being able to predict the time that the processed data would return, the customer would then be able to schedule those business procedures which are dependent upon the information being received. With the regular scheduling of data processing and the orderly flow of information between client and center which it permits, the value of a service center operation is significantly enhanced.

Systems work, and programing could be furnished. Most customers can be expected to have little or no familiarity with the techniques of system analysis and computer programing. These functions would be provided, or arranged for by the center. These services would include at least the following: problem definition;

mathematical problem analysis; forms design; and programing. Charges for this type of assistance would either be billed separately, or amortized in the monthly machine use expense.

Adequate security measures would be taken. An essential feature of a marketable data processing service is that the customer be assured at all times that no information supplied could fall into the hands of unauthorized personnel.

Steps which need to be taken to provide security include the following: Source documents would remain in the hands of the customer, where possible. Data delivered to the center would, if feasible, be sent coded on cards, paper or tape. Where required for utmost security, the actual processing of data would be monitored. The monitor could be an employee of the customer, or possibly a representative of a disinterested third party, such as a firm of accountants. Processed data would be returned to the customer as rapidly as possible. Data, files and tapes, retained at the center would be kept under lock and key in suitable storage facilities provided by the center for each customer requiring such security.

Having taken these precautions and provided these services to assure the privacy of information, the center would nevertheless take out a bond against the possible malfeasance of an employee, or against computer or operator error.

Customers could be directly connected with the center if desired. Through the use of remote input devices, located in the offices of the customer, data could be transmitted without delay to the data processing center. The customer would also be in a position to acquire information from the center with a minimum of delay.

The customer could be directly connected to his branches to speed the flow of processed information throughout the company. A desirable feature of service center operation is that it be able to accommodate the needs of certain clients to have data originating at one point, such as a central office, processed and immediately transferred to a second point, such as a branch office or a warehouse. A system of communications would therefore be established which would make this possible, should a customer desire this service.

Long term contracts should be solicited in advance. The service center concept is implemented most effectively if there is sufficient work contracted far in advance to load the center. Contracts should be let on a long term basis, if possible, for the benefit of both the customer and the center.

The customer should be supported with management services as required. The customer might conceivably require management services, as distinct from EDP system services. These would provide assistance of a confidential nature in the customer's office in such typical problem areas as the following: organization and department changes; recruitment; planning; cost reduction; conversion cost analysis and operating economies. By developing a working relationship with one or more consulting firms, the center would be in a position to recommend management, services and assistance of proven quality to its customers.

Independent service centers pose a number of special problems for themselves and their customers. The establishment of a service center involves the development of a complex servicing program. Many problems must be

solved by the center management if the program is to meet with success. Here are some of them:

First, the capitalization required to set up a center is relatively high. There is a long lead time between initial investment and return. The center must capitalize for space, equipment, services, promotion, marketing, development of package programs, and actual selling. In a sense, the center is a vendor and must propose its services, prove its value and otherwise compete with IBM, Remington Rand and other vendors.

Takes Specialized Personnel

Second, competent personnel for the EDP field are scarce and expensive. A brief review of the EDP personnel market in the New York–Philadelphia area indicates that qualified personnel are not easy to find. In Exhibit 1, a typical list of jobs and approximate salary ranges is given. In setting up a service center, one or more persons in each category would be required. (The establishment of the RCA service center at 45 Wall Street probably cost in excess of $1 million.)

Third, selecting computer equipment to provide acceptable services is a complex balance between the market for services and available capital. Although the desirable procedure would be to arrange in advance long range contracts with a number of companies, this negotiation is not always possible before having to make a commitment for equipment. A center may, in fact, select a working equipment complement, then find itself attempting to tailor a number of business problems to suit the system.

A service center may operate quite modestly, of course. The Automated Accounting Center of Connecticut, for example, features a Bendix G-15D computer for processing, with input furnished via punched paper tape and a NCR MICR Magnetic Ink Character Recognition Reader-Sorter. It is our understanding that the equipment complement is a preliminary one, predicated initially upon the requirements of the Automated Accounting Center of Connecticut.

As with all service center operation, we would expect the equipment complement to expand and perhaps be modified to suit the need and demand for services in the business community.

Fourth, a fundamental problem that faces a company which plans extensive bread and butter data processing is one of control. An EDP technician carrying out a feasibility survey is always impressed with the amount of duplication in processing effort and other waste motions in an otherwise well managed company.

The answer is to be found in the requirement for customer service and control. The EDP system will prove itself to the extent that it provides the same or better control at less cost, not to the extent that it lowers costs by dumping customer service and controls.

How to Maintain Controls

One of the problems facing a company considering the use of the service center is how to maintain controls. Among the banking applications to which considerable attention is directed at the present time is "demand deposit accounting." From a control point of view, this application is one of the most difficult, but by no means insurmountable, for a service center.

There is at least one independent service center in New Jersey which is attempting to market services to small

EXHIBIT I

EDP POSITIONS

Position Title	*Salary*
1. General Manager	$20,000 Per Year
	1,667 Per Month
2. Supervisors	$14,000 Per Year
	1,250 Per Month
	$15,000 Per Year
	1,167 Per Month
	$13,000 Per Year
	1,084 Per Month
	$12,000 Per Year
	1,000 Per Month
3. Chief Programer	$13,000 Per Year
	1,084 Per Month
4. Programers, Sr.	$ 9,000 Per Year
	750 Per Month
Programers, Sr.	$ 8,000 Per Year
	667 Per Month
Programers, Jr.	$ 7,000 Per Year
	584 Per Month
Programers, Jr.	$ 6,000 Per Year
	500 Per Month
5. Work Schedulers	$ 7,500 Per Year
	625 Per Month
	$ 7,000 Per Year
	584 Per Month
6. EDP Methods & Systems	$ 9,000 Per Year
	750 Per Month
	$ 8,000 Per Year
	667 Per Month
	$ 7,000 Per Year
	584 Per Month
7. Console Operators	$ 7,000 Per Year
	584 Per Month
	$ 6,600 Per Year
	550 Per Month
	$ 6,300 Per Year
	525 Per Month
	$ 6,000 Per Year
	500 Per Month
8. Tape Handlers	$ 5,500 Per Year
	459 Per Month
	$ 5,000 Per Year
	417 Per Month
9. Printer Operators	$ 5,000 Per Year
	417 Per Month
10. Tab Operators	$ 4,200 Per Year
	350 Per Month
	$ 3,900 Per Year
	325 Per Month
11. Tape Librarians	$ 4,700 Per Year
	390 Per Month
	$ 4,200 Per Year
	350 Per Month
	$ 3,900 Per Year
	325 Per Month
	$ 3,600 Per Year
	300 Per Month
12. Secretaries	$ 5,200 Per Year
	435 Per Month
	$ 4,200 Per Year
	350 Per Month
13. Receptionist	$ 3,180 Per Year
	264 Per Month

banks for this one application. A number of banks in Hartford, Connecticut are presently undergoing a study to determine the feasibility of establishing service center processing. It will be interesting to see how the customer service and bank control problems are resolved in these programs.

Estimating Computer Time

Fifth, the estimating of computer running time is always difficult for a service center and this complicates bidding for a prospect's support. The machine equipment vendors have been submitting proposals for several years to their prospective customers. None will sign a contract, however, guaranteeing the time quoted in his proposal. Aside from actual errors of omission or commission in such proposals, there are cogent reasons why actual running time may turn out to be longer than originally stated. In some cases, the variance exceeds 100 percent.

The following reasons highlight some of the difficulties in making the

operational times coincide with the earlier estimates: (1.) There may be changes in requirements. (2.) The expansion of the system during programing may add many unanticipated instructions. This is a very common experience. (3.) It is difficult to estimate precisely, without very detailed study, the statistical bunching of "hits" which may extend processing time. (4.) There may be difficulties in scheduling the runs with the consequence that the total running time becomes extended. (5.) A certain number of reruns may be necessary as a result of machine or operator fault.

It is not unreasonable to time a vendor's computer runs conservatively, and then add a contingency factor.

Sixth, there are difficulties in establishing priorities and schedules for a number of similar customers. Business applications require the establishment of priorities and schedules. Aside from the specific problems of assigning priorities and schedules, there is always the difficulty associated with the availability of input data and the vagaries of the computing machine. No one can predict beforehand, for example, that the Jones Co. payroll will be run on Friday at 11:00 a.m.

A number of general considerations are of significance to a Data Processing Center. The applications of interest to both customer and service center alike fall into three categories each involving different degrees of reference to files.

"One Shot" Solutions

Problems requiring no reference to files present no administrative difficulty to Service Center processing. Scientific and many engineering problems require no reference to files, but demand high speed internal processing for arithmetic operations. Examples of such problems are inversion of matrices, curve fitting, simplex calculations in Linear Programing, and "model" building in operations research. Such problems may require "one shot" solutions, although in model building, as is described in the next section, the use of a computer may be required for months.

Scientific Problems Easy to Do

Scientific problem processing in general requires only basic programing without any rearrangement of files or basic company organization changes. This is in strict contrast with a data processing application where a very expensive conversion is usually required. For instance, in a typical public utility that is on an addressograph system, the conversion cost to a computer system may reach $1.50 a customer.

Scientific applications customers also frequently do their own programing. Because of the specialized nature of the calculations involved they may then want a contract only for machine time at so many dollars per hour.

In addition, scientific applications require little input-output equipment. The bulk of the scientific applications is carried out in the high speed memory and arithmetic registers with little requirement for input-output capability.

Problems that involve little reference to files, yet require considerable calculations of current or historical information, form an important segment of computer applications. These include sales analysis, statistical computations, elementary inventory control, and a large assortment of simple operations research, "O. R." problems. Problems involving optimization, maximization or minimization are particu-

larly susceptible. Resources, as carried in files, are shared or allocated in accordance with some model or formula which is mathematical in form. Such problems require high speed computing and large internal memory.

O. R. Problems

O. R. is an effort to describe an operating function or functions in a company. In developing this description, O. R. is concerned with the dynamics of an operation, such as the inter-relationships between sales fluctuations, size of inventories, production control, and flow of goods to scattered warehouses. O. R. emphasizes the interaction of all parts of operations and causes recognition of those interactions in areas hitherto considered separate.

There are eight recognized phases to the application of O. R. techniques. These phases in the development and use of O. R. techniques are of interest to the customer and the service center alike. The recognized phases are as follows:

- Stating the problem
- Building the model to describe the system under study
- Obtaining a solution from the model
- Measuring the performance of the model
- Selecting the best choice among several alternatives
- Experimenting and verifying
- Setting controls and the range of applicability
- Implementing the course of action selected.

Listed below are eight ways in which EDP can help in solving O. R. problems for business firms.

(1.) Stating the problem precedes any calculations and may require only technical support from the Service Center. The requirements and policies affecting an operation must be clearly stated early in the study. These are assembled to form the problem definitions. Some academic practitioners have suggested that the problem be subjected to continuous refinement until solved. With this approach, however, it would not be known until the end of the research whether the problem was formulated correctly in the first place.

(2.) The Service Center could participate in building the model to describe the system under study. The "model" is a description in abstract form of an operation, such as by a mathematical equation or a few sentences or symbols. Description by mathematical equation is most desirable because it permits testing and study using a high speed computer. The model may be exact or probabilistic. It is said to be exact when its essential variables are identifiable and the element of chance negligible. It is said to be probabilistic when the element of chance or uncertainty is significant. Probabilistic models are more realistic and heavily dependent upon computers for solution.

(3.) The Service Center would be able to provide normal computing services usually without pressure to obtain a solution to the model. Essentially two procedures are employed to obtain a solution to a model. These are analytic and numeric. For typical business problems, the numeric method has considerable importance. In probabilistic models, sampling and statistical techniques may be applied. With the exception of analytic solutions, which are essentially academic

for practical use, a high speed computer system is of great help in solving O. R. models. For example, the CALTEX Corporation rented time at the IBM Service Bureau in New York for months in developing a model of an oil refinery.

(4.) The Service Center would be able to assist its customers in measuring the performance of the model. The measure of performance is an indication of how an operation is achieving its goal. In industrial work, a common measure is maximum net profit. Other measures might be minimum loss, maximum return on investment, maximum service, minimum cost, etc. Through the services offered by the Service Center, the performance of an O. R. model would be measured quickly and effectively.

(5.) The Service Center would be able to assist its customers by using the computer to select the best choice among several alternatives. O. R. models lead usually to a number of possible alternative choices of action. The mathematical work and computation is generally carried out to suggest a "best choice." Usually, each alternative choice will cause certain reactions, some of which are less desirable than others.

(6.) The Service Center would be able to offer laboratory type experimentation and verification to its customers. The model describing the procedure of an operation may be tested by experimental calculation for months on a sufficiently large sample to prove practicality. The American Sugar Refining Company tested a linear programing model describing warehousing and shipping of sugar for nearly two years at the Univac service center, before assigning certain levels of confidence to the model.

(7.) The Service Center would assist in setting controls on the model and in defining the range of practicality. The model itself is only an idealized representation of a true business situation. As such, it will produce simulated answers within a certain narrow range. Controls must be set which take into account the range of usefulness of the model. These can be set by the Service Center by examining a large number of solution runs from a computer for various ranges of the variables.

(8.) The Service Center would be able to implement the O. R. model on a continuing program. The O. R. model can be installed for regular processing as in a problem of inventory control, or allocation of resources. Furthermore, the installation of the model will affect other sources and uses of data. For instance, costs will be kept current and will be manipulated for the O. R. model and for other purposes. Even files may be changed somewhat to accommodate rearrangement of inputs and other data.

Tough Problems for EDP

Problems requiring considerable reference to files may present administrative difficulties to service center processing. A file reference problem is created by the number of transactions which occur in a given period of time and which are required to update the master file or a working file. The processing required for a file up-date run presents no serious difficulties, unless the run must be carried under pressure.

However, when many runs and many files are required, the administration problem of service center processing increases greatly. Exhibit 2, for example, is a diagram of integrated sales order processing. Inte-

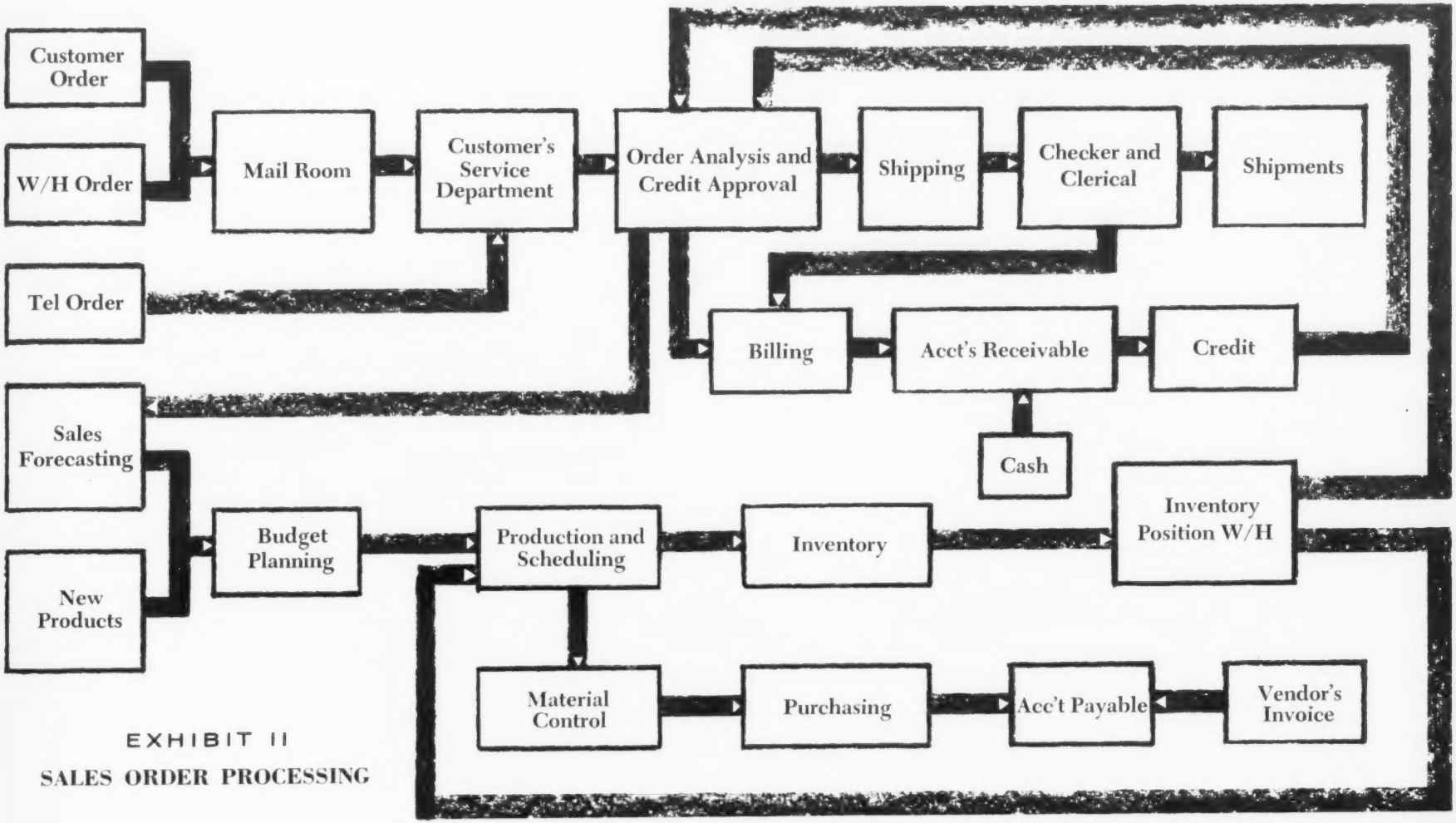


EXHIBIT II

SALES ORDER PROCESSING

grated sales order data processing is practical for a manufacturing company. Starting with a sales order, a system can be designed to provide from files the following information and/or reports: consumer credit, stock inventory position, pick-pack and shipping instruction, invoice and accounts receivable journal.

The control system on inventory and production is used to trigger the scheduling of economic production runs, efficient machine scheduling, loading and manning, the purchasing of material and tools, and the establishment of an accounts payable journal. Finally, the level of production to build inventory would be set by management based on budgeted capital and derived from a sales forecast. This level, in turn, would respond to sales orders and market demands, thus providing feedback to complete the cycle.

In its entirety, it presents probably an impossible processing program for any service center other than a large one or a company-operated one. The very nature of its interlocking files and runs makes for a difficult control problem. On the other hand, various sections of the processing function such as inventory control, production control, credit analysis and sales statistics are perfectly tractable for a medium or small independent service center.

Reduces Business Paperwork

A number of business problems offer opportunity for service center operation. These are as follows:

- *General Accounting.* All companies are concerned with proper accounting for business operations for taxes, accounts receivable, accounts payable, etc. Such processing generally makes considerable reference to files but presents no control difficulties. It is our general experience that interest in mechanized processing for general accounting increases with companies whose annual sales are in excess of $5 million.
- *Payroll.* All firms meet one or more payrolls, and payroll runs make considerable reference to files. These include hourly, weekly and monthly workers, and those operating on a commission basis. By itself, payroll processing may be a difficult and/or uneconomical application for a computer system, although conceptually, the mechanics of computer operation for payroll are disarmingly simple. The difficulties inherent in payroll processing arise mostly from conflicts in policy. In the State of Minnesota, for example, the Department of Highways and the Department of Administration have evolved two different approaches to payroll processing which are mutually exclusive. Both of these programs are, in turn, subject to further restrictions by the Departments of Civil Service and Retirement.

  In many industrial programs involving incentives and piece work arrangements for some workers, the payroll run distributes costs to specific projects and is tied in with costing and other complications. For a service center operation, five different customers may require five different payroll programs. Although these difficulties exist, payroll is nevertheless capable of being run on a computer and may be an important application of the work for larger customers.

- *Inventory Control.* A complex model for control of inventory, production and cost represents good Service Center application, but requires a Service Center of significant size. All firms have responsibilities and interests in these areas to a greater or lesser degree. The area of inventory control is one for which there is the most experience and for which many computer runs are made.

  Inventory control consists mainly of determining economic procurement quantities and scientific reorder points so that the total cost of the operation of buying and carrying inventory is minimum. The problem, in its broadest generality, consists of manipulating and balancing the costs of buying, carrying and running out of inventory. The significance of inventory control is that it makes it possible for a company to squeeze up to 25%, in some cases, out of the dollar value of inventory without downgrading the quality of service that a company offers. Considering the freeing of capital which results, every company should review its condition in this area.
- *Manufacturing Problems.* Such problems as the number of automatic screw machines which can be tended by an operator, or the number of repairmen needed to service a battery of machines so that the cost of the operation would be minimum, considering man and machine idleness, can be readily solved at a computer service center by a "roulette-like" method called system simulation. For those skeptics who can testify to a recent union contract which fixes the man-machine relationship, we wish to point out that ignorance of cost information is hardly a satisfactory tool with which to approach the bargaining table.
- *Statistical Computations May Be Readily Carried Out at a Service Center.* The accumulation of information from historical source data into a variety of histories or statistics is an important part of business computations. Actual statistical calculations normally make little reference to files. However, the accumulation of information into historical summaries requires file maintenance.

"Management by Exception"

Management by exception postulates a control system within which the quality of an operation is guided normally between some upper and lower limits. As long as these two extremes are not pierced, then management knows that "everything is fine," and need not be concerned with any action or decision making. However, by the very nature of the control system, an out-of-control condition requires action.

A problem of very subtle implication, with which we shall not concern ourselves, is how to design management by exception systems. These concepts are developed during O. R. studies and research. A variety of such systems have developed in the last few years, with considerable success in many areas. To illustrate a relatively simple inventory control model, an example is given from the experience of one of the service centers.

The planning for service centers operation by Data Processing Corporation of America (DCPA) envisions data

processing programs for various business functions. One program in the area of sales order processing is based on the use of a Friden "Flexowriter" to develop punched paper tape. Other equipment could have been used, such as the Victor "Data Punch," the Remington Rand "Synchro-Tape" typewriter, the National Cash Register Punched Tape Recorder, or a comparable device by the Burroughs Corp.

The Friden accepts data from edge punched cards, tab cards, punched paper tape, or keyboard entry and prepares a typed hard copy document. The machine prepares as a by-product punched paper tape which may be used to produce reports on sales order analyses, customer activity, and inventory control.

Assume that a manufacturing company receives handwritten and telephone orders from its salesmen, representatives and customers. These orders call for certain quantities of finished products and piece parts. A master file of edge punched cards contains such typical data as customer's name, address, account, code and class numbers.

After the orders have been checked and coded and back orders assigned, they are sent to the order writing department. A master edge punched card is pulled for each customer and the edge punched card is pulled for each item of inventory. These latter cards contain stock number, code number, description, base metal alloy or plastic, and price.

The operator first writes the order number, the date and the salesman number manually via the keyboard and then reads the data from the master card into the Flexowriter. An end item or piece part is then added by reading its respective edge punched card to develop a line item of inventory. The quantity and other pertinent data are added manually on each line.

The Computyper

The by-product paper tape is read into a "Computyper" which writes and computes invoices in one operation. The Computyper prints the headings and descriptions, and computes and prints extensions, additions and deductions, etc. A by-product punched paper tape is also prepared which contains data for statistical reports on sales, inventory and accounts receivable. It is this by-product tape which can be processed quite effectively at a service center.

The inventory control for the manufacturing company is carried out on a "management by exception" basis. On a magnetic tape file a complete list of items is kept in stock number sequence. For each stock item, data are maintained on the quantity on hand, days of supply, reorder point, items in process, date available, lead time, costs to purchase and to carry and other factors. An item which has reached the reorder point is to be posted for action.

The computer also develops sales analysis information quickly. Data is furnished on the productivity of salesmen, and commission is calculated. Reports are prepared on customer activity, orders on hand, sales for the month and year to date, etc.

A report furnishing quantity on hand is required by the order clerk of the customer for approval. The plan chosen to present this information represents an economic compromise satisfactory to the customer.

The order clerk posts manual tallies on lists which are updated and prepared by the computer periodically on a cycle basis.

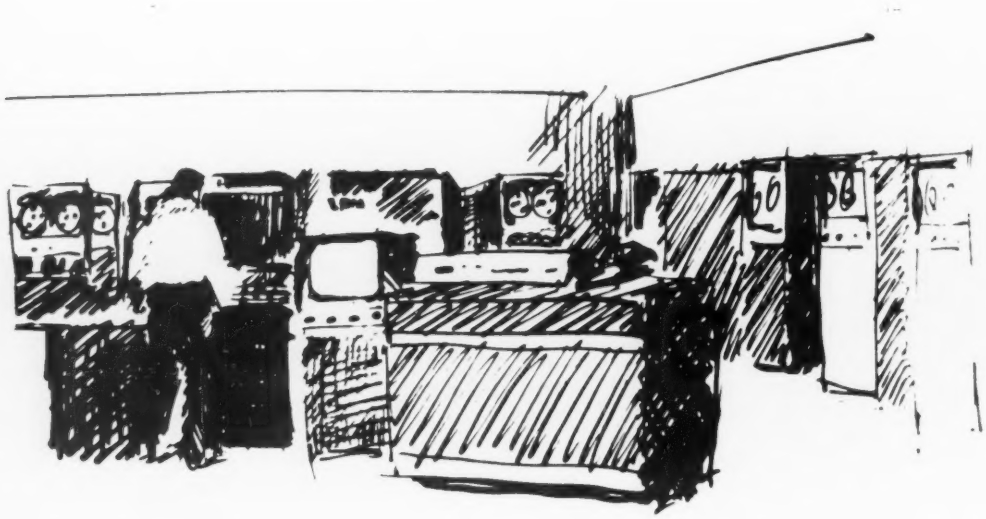
How Small Businesses Use EDP

There is every indication that service center data processing can perform a real function in bringing to smaller businesses the same lower unit cost processing that the large companies enjoy. In addition, the use of a service center would enable the smaller company to develop marketing strategies and better information systems, and thus maintain a competitive position in these years of rising costs and shrinking profits.

The use of specific types of input devices and other components of hardware required at a center would have to be evolved to suit the business community rather than the other way around. We should like to comment on one input device which would be naturally available at a bank, such as the MICR. The extension of MICR to a large number of non-banking operations is restricted by the fact that the medium is numeric only and must be printed in a certain area on the document.

Optical scanning equipment, on the other hand, is assuming greater importance each year because of its inherent flexibility and usefulness. We are looking forward to a rash of new equipment announcements in this area.

The use and expansion of service center concepts has been growing rapidly. Companies starting at a service center tend to grow up until they can manage their own computer system. In the meantime they enjoy the advantages of electronic processing and pay for the service on an as-needed basis.



SOME IMPLICATIONS OF THE NEWER ANALYTIC APPROACHES TO MANAGEMENT

W. W. COOPER

The liaison between science and management, which has made terms such as linear programming and statistical decision theory part of the business vocabulary, is now being extended in this country and abroad to open new horizons for business and the scientist. Here is a quick roundup of developments to date and a look into the future.

Professor William W. Cooper teaches Economics and Industrial Administration at the Graduate School of Industrial Administration of the Carnegie Institute of Technology and is co-author (with A. Charnes) of a soon-to-be-published book about management models and industrial applications of linear programming. He has the distinction of having been the first president of The Institute of Management Sciences.

Linear programming, game theory, queuing theory and statistical decision theory, these are some of the newer analytical techniques. Others are: simulation, gaming and Monte Carlo analyses which, in company with high speed electronic computers, have expanded to include systems analyses of adaptive systems, heuristic programming and, more generally, artificial intelligences.

Most of us are familiar with some or all of these—at least as they have been embodied in "operations research," "management science," "automation" and related to, or applied in, management. Numerous companies have now utilized some or all of these approaches. In some cases they now even have available, and on their full time staffs, persons who are qualified experts in one or more of these activities.

We may remind ourselves that only a decade or so ago these words were alien and unknown to most managements. Many of them, in fact, had not even been invented or developed to a point where, even in science, they could easily be isolated and identified as "separate" and important activities. Equally important, and also interesting, is the change in our outlook towards the underlying causes from which these developments have

• This article is based upon a talk given by the author at a meeting of the Pittsburgh Chapter of the Society for the Advancement of Management.

sprung: I think that we now expect, for instance, that still further changes and new developments will henceforth be the normal state of affairs. In fact, I suspect (like most of you) that the trend of these developments is likely to be one of acceleration and proliferation rather than one where retardation, contraction or leveling off will occur.

It is possible, of course, that these subsequent developments will displace or transform existing managerial practices, including even some of the newer analytical techniques that we have just mentioned. But this is less important to us than another variation.

Management Problems Aid Science

It is the liaison that has now been effected between management and science. The use of received scientific knowledge and methodology by management was demonstrated, of course, at least as far back as F. W. Taylor and his associates and followers. There is therefore no great need to dwell on this so let us refer, instead, to another aspect of the liaison by means of which the problems and processes of management are used as a stimulus (and even a guide) for research which is designed to push back the boundaries of science itself.

This has naturally attracted some of the best and most distinguished scientific talent. The efforts of these scientists have been intense and sustained so that, apparently, they find the problem materials here both scientifically satisfying and rewarding. That is, they have been satisfied in terms of the depth associated with the challenges here; they have also found their endeavors rewarded by fruitful contributions to science as well as management.

I do not mean to suggest that the liaison is one in which this kind of talent is available at the beck and call of management. It is represented rather better as a broad spectrum in which the practicing manager and his staff specialist or consultant lie at one end, and the abstract scientific theorizer and methodologist lies at another end. These two ends of the spectrum are related through a series of intermediate links all of which now appear to be on the way towards being adequately manned and attended to.

Furthermore, provision is also now being made at major centers of learning for the educational developments that are needed to provide a continuing supply of persons with the necessary prerequisites and abilities to continue in the traditions of scientific research that have now been initiated, and to translate the results of this research into practical applications, on the one hand, and communicate new problems and other materials to the instant sciences on another hand.

U.S.S.R. Employs Mathematical Approach

To underscore these points, and to indicate the scope of the events referred to, I shall now quote from a report on related developments from the other side of the Iron Curtain:[1]

> "From the 4th–8th of April 1960, at the Academy of Science there was held the first scientific conference for the use of mathematical methods for economic research and planning. It was brought together by the initiative of the Departments of Economics, philosophy, and law, and the Siberian Department of the Academy of Science of the USSR.
>
> "At this conference for the first time there met for joint work representatives of two independent

branches of knowledge—economics and mathematics. There were also a large number of representatives from economic practice—production men, planners, statisticians and teachers. They met to discuss the first results of economic-mathematic research, and to plan the further course of the introduction of new methodology into economic science and into production planning practice."

It is of interest to note that this same article refers to 56 reports which were distributed at this conference, and covered in 6 sessions organized according to the following divisions: Mathematical analysis of expansion of productivity, Interdepartmental balances, Linear programming, Mathematical methods for the solution of transportation and technical-economic problems, Mathematical statistics.

The attendees at this conference included high officialdom (such as the President of the Academy) and many of Russia's outstanding scientists. After noting the resistances that had been encountered—e.g., from the practicing bureaucracy—the conference concluded on a positive note, which I quote in some detail as follows:

"(**New Council and Institute**) Among the decisions of the conference were noted concrete measures directed to the wider introduction of new mathematical methodology. It is to be used in practical economic research and planning in our country.

"Given present trends, there was felt a need for a single coordination center which could direct, in a planned manner, the theoretical and practical work in this field. Without having single unified guidance, without mutual agreement in the work of scientific search and experiment, departmental efforts will get lost in the usual narrow channels. Subsequently it will require more, unjustified, effort to bring them together in a comprehensive overall complex of mathematics in economics.

"The first step for the creation of such a center was made through the decision to create at the Academy of Science an interdepartmental scientific Council. It is to deal with questions of use of mathematics in economics.

"Representatives on the council were drawn from economic and mathematical sciences, as well as planners, production men, statisticians and engineers.

"For the solution of scientific problems of economic-mathematical methodology, the conference recommended to the Directorate of the Academy of Science, USSR, the creation of a special Laboratory, and in the future, an Institute.

"(**New Publications**) At the same time the conference emphasized the need to organize a means of spreading information in this field. It recommended that journals regularly carry relevant articles. Also, books should be published on the given theme, as well as translations of foreign materials.

"(**Education**) Further, the conference considered existing regulations for the training of personnel capable of independently preparing decisions on economic mathematical tasks. It was felt that the present training was not satisfactory. Broadened teaching programs are needed in higher institutes of economics. Mathematics, linear and dynamic programming, and so on, are required. Also it is necessary to create courses to raise the mathematical qualifications of economists.

"The carrying out of these measures will guarantee the availability of

trained personnel endowed with the newest methods. They will be capable of fighting for the solution of production and planning tasks.

"The introduction of mathematics and the use of computers in economic research and planning in a substantial fashion will enrich economic science. It will raise the level of planning guidance of the national economy. This will serve as one of the factors which will hasten the transition of our society on the path to communism."

This concludes the report referred to, as well as my quotations from the cited translation of it. The main point to be made is that the activities we have been discussing are now represented on a broad base that is not confined to one political-economic system in one country.

Management Functions and Mathematics

Bearing this, and related, points in mind, we may now turn to another variation of our theme and inquire as to the nature of the concepts and applications that have been made. This will then provide a point of departure for prognostications later about some possible future courses in these developments.

For this purpose we may think of managerial activities and problems as being classified into three broad groups: (1) planning (2) operations, and (3) control. The *planning* phase of management, as here conceived, is primarily concerned with the procedures for delineating and assessing alternative courses of action.

Planning

Generally this involves forming some sort of image, mental or otherwise, in terms of which data are assembled and likely consequences are traced. The "planning decisions" do not usually involve actual commitments of resources and, in this respect, we can distinguish between "planning" and "operations" in that decisions to commit resources are made in the latter rather than the former of these two divisions that we are discussing.

The intended distinctions can perhaps be made sufficiently clear by referring to, say, a budgeted inventory level for a certain item as a planning decision while the actual issuance of a purchase order represents an operating decision when it is intended as a *bona fide* commitment to pay for an item which will then be supplied by a specified vendor.

Control

With these examples and distinctions in mind we may then refer to a third managerial activity, "control," which is concerned with conformance between plans and operations. The *control* area is, as we shall see, somewhat more subtle in its connotations than are the activities and associated constructs in planning or operations. For the moment, however, the usual accounting characterization of a variance (red or black) from a standard may be thought of as an immediately simple example in the control area.

To date, most applications of the newer analytical techniques have occurred in the area that we have characterized as planning. More specifically the bulk of these have been directed to functional (rather than organizational) planning.

Examples are: linear programming allocations in machine loading schedules and financial studies of capital facilities alteration proposals; queuing analyses of maintenance forces; game

theoretic studies of advertising budgets; and so on. By contrast, studies directed towards prescribing staffing qualities and organization relations are in a more backward state—perhaps because these topics quickly merge into the more subtle field of control problems as represented by, say, the kinds of issues which attend auditing examinations of internal-control and -check systems.

In summary, then, the bulk of the applications and the bulk of the research has occurred in the area of functional planning. More recently, work has begun to be initiated in the area of organization planning, too, mainly in the form of computer and simulation studies. These are still largely embryonic or programmatic in character, however, and so I think we can leave them aside in order to focus on some of the newer analytic approaches that have been associated with recent mathematical applications in functional planning.

We might now find it useful to distinguish, with Warren Weaver,[2] various divisions of mathematics according to whether the main advantages offered are in the ability to deal with (i) subtlety, (ii) complexity and (iii) disorder. Representative specimens in each division are (i) calculus, (ii) algebra and (iii) statistics.

Statistics

Consider the area of statistics as a first example. Quality control and acceptance sampling represent adaptations of an underlying mathematics which has enabled managements to apply statistical principles to such diverse areas as production, procurement, accounting, control of clerical operations, and so forth. Here the ideas of randomness are systematically applied to the numerous combinations in which variations can occur (in a process or product) as a result of chance alone, and these are then distinguished from other variations that can also occur when more orderly causes are operating.

As the name suggests, these applications are directly pertinent to the control area of management, and the statistical quality control literature is indeed replete with discussions of problems arising because of lack of conformance between plans (e.g., blueprinted product specifications) and operations (e.g., products produced by an ongoing process).

On the other hand, these are applications only to rather simple parts of the control process. While (to date at least) attempts to extend them to the more significant multi-dimensional problems of an organizational or accounting variety have not been wholly successful,[3] it must also be remembered that the subject matter of statistics is vast. It is backed by an established and growing literature which is rooted in a long and continuing tradition of scientific research whose possibilities are far from exhausted by such managerial applications as have been essayed.

The history of major developments in statistics may be traced through the original "theory of errors" in the natural sciences to the revolutionary developments of the 1920's and 1930's which occurred in conjunction with an extension of these ideas to biological (including agricultural) phenomena and problems where rigorous and efficient principles of experimental design were finally evolved by reference to statistical considerations.

Statistical Decision Theory

This is, of course, only a thumbnail sketch which supremely oversimplifies a rich and varied history. It will help us, however, to distinguish these preceding developments in statistical mathematics from those that are currently embodied in the name "statistical decision theory."

The latter, as its name suggests, has more of a managerial orientation than is usually to be found in the preceding developments. In fact, R. A. Fisher, the chief architect of the statistical revolution of the 1930's has criticized rather strongly the ideas with which A. Wald introduced the topic of statistical decision theory—because, he contends, the relevant cost-and-benefit matching relations that are needed for the decision functions have neither meaning nor relevance for purely scientific work.[4]

The same kinds of relations (costs and benefits) are, of course, immediately pertinent to the problems of management where statistical-mathematical ideas are beginning to exert an influence which either modifies some of the preceding applications, as in quality control, or indicates further areas of potential use, as in rational investment planning.[5]

For our present purposes, we need only note two things: One, the suggested extensions in management are almost entirely directed to planning activities. Two, statistical decision theory has, in fact, provided a new unifying viewpoint and a stimulus to further scientific research in statistical theory, as witness, for example, the following quotation from the opening of a recent text by two well known statisticians:[6] "Statistics is a body of methods for making wise decisions in the face of uncertainty. This modern conception of the subject is a far cry from that usually held by laymen. Indeed, even the pioneers in statistical research have adopted it only within the past decade or so."

The algebra that is associated with linear programming in management planning, will help us to indicate rather quickly what we mean by complexity. Consider, for instance, the loading of products onto a sequence of machines. The products are numerous and so are the machine possibilities. The data consist of machine processing times and capacities, customer orders, market potentials, and so on.

At least to the level of understanding that is now needed for applied work, each datum is simple enough. The solution variables also yield reasonably straightforward interpretations—at least if one does not ask too many questions—and this is all to the good.

On the other hand, the number of variables and the number of conditions (or equations) that need to be considered can easily run into thousands in many applications. Thus if one tries to ensure that, say, a minimum total cost will be achieved for the planned loads he quickly finds himself enmeshed in a huge—hence complicated—problem where efficient analytical guidance is welcome when it is available.

Business Mathematics Not Hard

This kind of complexity offers an example of a situation where the recently developed mathematics that is associated with linear programming may be useful. I do not wish to argue that all of this mathematics is obvious or easy. This is not the case. But I do wish to contrast it with the calculus, or analysis, kind of mathematics that

many of us have been exposed to and used at one time or another.

As you know, the expressions that are typical in this kind of mathematics refer only to a relatively small number of variables: A time rate of change of one variable, an acceleration of still another variable and possibly a few connecting relations between them may be all that is apparent in an explicit statement of such a problem. On the other hand, implicit relations may be encountered at various levels of an analysis and these subtleties may then require recourse to recondite and advanced mathematical techniques.

Indeed, it is often the case that no solution is possible in terms of elementary algebraic relations. The end of an analysis then still yields an expression whose meaning is not wholly evident without recourse to strong bodies of supplementary theory—e.g., the theories of physics—and rather careful interpretations of such purely mathematical ideas as "infinitesimals" and the "infinitely large" or "infinitely numerous."

These three examples of mathematics and their usage will at least help to suggest, I hope, that the field is capable of division according to the problem needs and the state of knowledge which prevails in management. Thus, the most striking developments of the newer analytic approaches have, in recent years, occurred in the areas of disorder and complexity—rather than in the area of subtlety where mathematical aids have proved indispensable in dealing with the more subtle problems in the developed sciences.

Although the areas of disorder and complexity, separately and in combination, have received most of the attention to date, it is possible that the accumulation of substantive knowledge via these channels will open other areas at a later date where the mathematics of subtlety will be needed in management, as in other, sciences.

If this does occur, we will find, then, I think, that the progress of this mathematics in its relation to the natural sciences will already provide results that are in a position to accommodate many of our requirements—at least initially.

The Area of Control

The control problems of management are now beginning to receive increasing research attention and here, as we shall see, the phenomena are likely to involve varying degrees of subtlety as well as complexity and disorder. Computer simulations involving so-called man-machine systems and "live" organization units have provided one avenue of attack. Another is represented by combined analytic and laboratory approaches in the study of such phenomena as auditing (in both its supervisory and accounting senses)[7] and budgeting (in the sense of a control instrument).

A. Stedry's recently released book, *Budget Control and Cost Behavior*,[8] is illustrative of the latter kind of development. To isolate Stedry's topic, we may use the distinctions that we previously introduced and relegate the forecasting and coordination aspects of budgetary preparation into the area of planning activity. Then we can note that such problems as points of budgetary initiation and the designation of participants in the process of adjusting the initial—or subsequent—budgetary levels are a part of the problem of securing effective budgetary control. These problems and the subsequent accounting reports are then judged by

reference to their effects on behavior.

Thus, in Stedry's own words,[9] "A 'good' *control* budget is one which produces 'good' results. If it is desired to minimize cost in a given department, and if a budget of $1,000 produces a cost of $1,001, and a budget of $300 produces a cost of $1,000, the latter is a better budget. The magnitude of the budget figure is unimportant other than in terms of its impact on cost."

Of course, Stedry does not deny that the $1,000 budget provides the better forecast and, possibly, the better basis for coordinating the plans of various divisions within a firm. But he does suggest—and adduces direct laboratory evidence in his support—that this does not settle the control question.

By means of his experiments, Stedry was able to state and test a variety of circumstances in which so-called tight and loose budgets might be made to apply, as well as a variety of circumstances in which the person to be controlled might better initiate (or participate) in the process of budgetary formation and also to delineate circumstances in which this same participative procedure might have an wholly adverse effect on behavior.

There are still other aspects of this study that are worthy of attention, but here I shall mention only that Stedry's approach to cost (and performance) reporting suggests the introduction of a category that might be called "motivational costs" because they are tailored to produce, in each individual case, the kinds of motivation which will lead to desired patterns of behavior.

In this view the now common standards of "accurate" and "timely" cost reporting might be replaced with an alternate approach wherein personal characteristics and the job that is attended to by specific persons need to be considered before deciding upon the information that is to be supplied on, say, variances from standard according to one uniform and unvarying set of reporting rules. Extended still further, one might think even of supplying information to different individuals which will lead them to take corrective action in advance of the errors that they might otherwise make.

Stating the matter in the technical jargon of one of the newer analytic approaches, we may imagine a person who tends to assess the "payoff matrix" of a certain "game" in a way that leads him to play it rather badly. But then we might replace the true matrix with another (artificially contrived) one in terms of which this same person will, by his own assessments, play the true game rather well.[10]

These possibilities are certainly ones that are managerially conceivable in terms of the twin duties which management must ultimately assume: (1) to inspire people to want to do what they ought to do and (2) to make it possible for them to do this notably better than they could without the aid of management.

You will note that I have deliberately avoided any implication that the "oughts" are those that a particular management—or that whole group of top managers—happen to cherish. We are still far from having exploited all the conceivable managerial forms for bringing the correct "oughts" into existence.

The area of control is intimately connected with organization design and analysis. These are, in turn,

intimately connected with individual character formation and behavior and, ultimately, with the whole fabric of society. Hence, I propose consideration of this topic as still another variation on our theme, since it was implicitly introduced in preceding paragraphs. I shall do so, however, in a somewhat different way.

Research in this area is at best embryonic, as I have already suggested. So let us turn to certain criticisms now being made of management practice (and education) in this area. In particular, I shall make a topical selection from William H. Whyte's *Organization Man*[11] and try to discuss these in a way that will help advance our analysis of possible implications from the science-management liaison decribed earlier in this paper.

Consider, first, the way in which Mr. Whyte indicts management in the form of what he calls "the administrator":[12] "The creative individual he does not understand, nor does he understand the conditions of creativity."

This indictment certainly carries force with anyone who has witnessed the common and constant frustrations of creative individuals in the type of organizations Whyte decribes. One must be careful, however, to distinguish between "the administrator" and the managerial instruments he employs. For our purposes, at least, it is also necessary to distinguish between currently available managerial forms and the kinds that might be invented or developed in the future.

Mr. Whyte has examined and savagely described some of these modes of management and "scientism." I would suggest, however, that neither management nor science is as static or as stable as Whyte's discussion implies. I would also suggest that the same idea may have quite different consequences when it is coupled with different ways of managing it.

Personnel testing and selection may be used as a case in point if only because Mr. Whyte has seized upon these as major symbols of current managerial (and "scientism") shortcomings.[13] Let us therefore imagine how ideas of personnel testing and selection might be used with improved modes of managerial implementation.

Suppose, for instance, that we are able to develop the means that are needed to deal with the subtlety, complexity, and disorder that would be involved if we were to undertake any large-scale and continuous matching of a multiplicity of individuals with all of their relevant relational possibilities.

With such instruments at hand, we might then be able to manage arrangements whereby organizations were accommodated to the relevant individuals and to the tasks that should be performed. All of this might then be done in a notably more flexible manner than is now, apparently, possible. This, in turn, would probably lead to different social fabrics and it might also produce a different "Social Ethic."[14]

I have just supposed that a different "Social Ethic" might emerge from continued progress in managerial instrumentation and organization. But we might also be led to a different view of even this same Social Ethic—i.e., the one that Whyte inveighs against—if it were to prevail under an altered series of managerial arrangements. Note, for instance, that the present managerial practice (or custom) of fixing each individual in a particular geographic locus and or-

ganization hierarchy for his work need not be regarded as a permanent and unchanging feature of managing.

Historical and contemporary data (here, and in the Soviet Union and elsewhere) suggest, to be sure, that the habits and expectations engendered by repeated relations of propinquity and positioning of individuals in relatively fixed, or static, hierarchical arrays are, at present, a necessity for many of the current modes of managing. But these are data that antecede the kinds of developments we are discussing, and hence are neither practicably decisive nor scientifically compelling. In certain kinds of large-scale, scientific development and research contracts, for example, there have already appeared cases in which it has been possible to shift persons across the boundaries of established legal entities, as personal talents and interests have suggested and as the circumstances of the task have demanded.

Such shifting has been accompanied, of course, by awkwardness and organization straining.[15] But I would suppose that we might ultimately develop better instruments for such accommodations. I also see no reason why a boundary should be established around the scientists in an organization. Automation, when it has been pushed far enough, may well take a form in which individuals operate across a variety of organizations in order to perform their services to best advantage.[16]

I do not wish to convey the impression that these developments will come either easily or rapidly. I am simply using the illustration of possibly more fluid organization relations in order to supply some perspective on the topics of personnel testing and selection and the Social Ethic with which Mr. Whyte associates them.

The point is that these alterations in managing could bring about a situation in which these same management (or "scientism") ideas and this same ethic might then be used to unlock rather than repress the creative "individuality" which is a main concern for Whyte in his studies.

Something more than an examination of the current "facts" of management is evidently required if we are to finish our assessment of the difficulties and the dangers that Mr. Whyte has called to our attention. Unfortunately, he does not provide us with an explicit prognosis on the future course of managerial developments. Hence we cannot examine his ideas on this subject and so, perforce, I shall turn to another topic that has been suggested by his concern.

It is "business education." I select the topic, not merely because of its interest per se, but also because it will help highlight the shortcomings of a purely "factual" approach to the topic that we are examining. For, under the impact of some of the newer analytic approaches, there are already strong signs of an alteration in this education which may well negate most of Mr. Whyte's main thrusts against it.

Noting the large, and rapidly rising, enrollment in business and commerce curricula, Mr. Whyte proceeds as follows in his discussion of the training they provide for the organization man: "These figures bring out a very important point. The conflict is not, as some embattled humanists believe, between the sciences and the liberal arts. *The conflict is between the fundamental and the applied.*"[17] [Italics supplied.] He then, shortly thereafter, quotes from *The Daily Pennsylvanian*

(of the University of Pennsylvania student body).[18] I now excerpt from his cited quotation as follows:

> "The first and most important destructive influence at Pennsylvania . . . is the Wharton School of Finance and Commerce. Justly famed for the excellent business training which it offers, and for which it grants an academic degree, the Wharton School by the sheer force of its reputation and undergraduate appeal has given to undergraduate social and extracurricular life an atmosphere which, while it is seldom anti-intellectual, is usually nonintellectual, and which tends to discourage the popularity of those interests which ordinarily occupy the time of the students of other universities where the school of liberal arts is the main impetus for student activity."

Discipline and Imagination

I am myself a product of a school of business and can therefore attest to the verisimilitude of Mr. Whyte's descriptions, at least in my own case. But I do not agree with either his analysis or his statement of conflict. The earlier writings of Professor A. N. Whitehead[19] were, I think, closer to the mark when (in his discussion of the business school) he becomes preoccupied, inter alia, with the coupling of discipline and imagination as a main feature of this part of the educational (and research) process.

If the discipline referred to is scientific or analytical in a sense akin to, say, that in engineering, then Professor Whitehead may have been premature. But this prematurity may also have to be accorded the status of prescience since the kinds of developments that we are discussing now make it possible to undertake this approach in large and important areas of business education. They most certainly make it possible, in any event, for business schools to undertake research in this vein, as some of them are now beginning to do, and this itself augurs well for the educational process.

The recent Ford[20] and Carnegie[21] Foundation reports have delevoped these topics both constructively and in detail.[22] Hence, we can lay them aside here in order to follow out another of the ideas that is suggested by the following quotation from Whitehead's essay:[23]

> "The universities have trained the intellectual pioneers of our civilization—the priests, the lawyers, the statesmen, the doctors, the men of science, and the men of letters. They have been the home of those ideals which lead men to confront the confusion of their present times. . . . The conduct of business now requires intellectual imagination of the same type as that which in former times has mainly passed into those other occupations; and the universities are the organizations which have supplied this type of mentality for the service of the progress of the European races."

Up to this time, the schools of business have tended to take the existing states of knowledge and methodology in *both* management *and* science as given. They now have an opportunity to vault over both of these states, as they now exist, and thereby contribute to science and to management.

In the process of doing this they will help to equip their students to be

intellectual—i.e., educated[24]—pioneers in the innovation of social institutions. This is something that society can rightfully expect of them (as well as their students) in addition to their other duties such as discovering and evaluating new knowledge and established practices.

Insofar as their own research and teaching acts as a prod, or a stimulus, for other schools that are gathered on the same campus, the schools of business will also then implicitly justify their presence as members in an academic world which is concerned with advancing our higher learning. This will not, however, be gained, at least as far as the management schools are concerned, by joining in Whyte's distinction between "the fundamental and the applied." The two should, rather, here, be joined—as they will be when schools of management learn how to adjust the sciences to their applications and their applications to the sciences—in both their research and educating activities. These schools will then have come closer, in their social setting, to the goal that Whitehead ascribes to all technical education[25] "... a commonwealth in which work is play and play is life. This is the ideal of technical education...."

Conclusion

These variations on the theme, some implications of the newer analytic approaches to management, may provide some general guides for the reader's imaginings. I now conclude by reminding you of the significance that we have been attaching to the recently established liaison between science and management. We might in this manuscript have varied this theme in order to explore some of the dangers that could conceivably emerge from such a liaison, as well as dangers that might emanate from other quarters to frustrate or subvert some of the developments that we have suggested as likely candidates for examination.

In any event, recent years have witnessed an evolution of new methods and instruments of analysis which have enabled the scientist to come forth from his laboratory into the world of management. The resulting situation may be as pregnant as the one described by Max Weber in *The Protestant Ethic and the Spirit of Capitalism:*[26]

> "The great Protestant reformers managed to bring forth the monk from his monastery. There then resulted an invasion that infused into management a spirit of sustained "rational-economic" dedication to the tasks of enterprise.
>
> "This, together with a developing set of methods and discoveries, in the hard sciences and technology, ultimately transformed an existing feudalism into a modern capitalist and industrial society. This transformation may have made the individual less secure in some ways, but it provided him with other benefits (and dangers) greater than any that he had previously known."

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8. New York: Prentice-Hall, Inc., 1960.

9. *Op. cit.*,-p. 17.

10. See A. Charnes and W. W. Cooper, "Management Models and Industrial Applications of Linear Programming," *Management Science* 4, No. 1, Oct., 1957.

11. New York: Doubleday and Co., Inc., 1957.

12. *Loc. cit.*, p. 57.

13. See, e.g., his Appendix, "How to Cheat on Personality Testing."

14. This term is used by Mr. Whyte to characterize "... the contemporary body of thought which makes morally legitimate the pressures of society against the individual. Its major propositions are three: a belief in the group as the source of creativity; a belief in 'belongingness' as the ultimate need of the individual; and a belief in the application of science to achieve the belongingess." (*Loc. cit.*, p. 7.) Mr. Whyte, it should be noted, proceeds to qualify such terms as "individual" and "societal"—but neither so adequately nor so succinctly as Aristotle's ancient, "He who is unable to live in society, or who has no need because he is sufficient for himself, must be either a beast or a god." (Cf. *The*

Basic Works of Aristotle, R. P. McKeon, ed.; New York: Random House, Inc., 1941, p. 1130.)

15. I do not mean to suggest that the "facts" of inter-organization assignment are new or are even now confined only to scientists. I choose this example partly because Mr. Whyte has himself noted the exceptional status accorded to certain scientists and creative workers in some companies (cf. *loc. cit.*, pp. 446 ff.) and partly because some of the organization strains resulting from the need to effect these accommodations are of a relatively novel or revealing sort—as when, say, under the promptings of some of their scientists, company managements have been willing to permit these persons to remain on the payroll while servicing, or being serviced by, other organizations (e.g., universities) which sometimes do not even reimburse either these scientists or their parent companies.

16. See Appendix V in *Automation* (London: Her Majesty's Stationery Office, 1956) for references to research on management structures under automation that is being conducted in England and the USSR. See also W. W. Cooper, "Management Science and Management" (Pittsburgh: Carnegie Institute of Technology, Graduate School of Industrial Administration, ditto report, 1956).

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18. Cf. *loc. cit.* pp. 93 ff.

19. *The Aims of Education* (The Macmillan Co., 1929) republished as a Mentor Book in July, 1949.

20. R. A. Gordon and J. E. Howell, *Higher Education for Business* (New York: Columbia University Press, 1959).

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24. I am dealing here with only their technical education, in Whitehead's sense, and hence ought to warn the readers of this paper that there are issues of wisdom, self satisfaction and culture that also need attention. Cf. Whitehead, *loc. cit.*, *passim* on the subjects of liberal and technical education.

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What happens when the Organization Man meets decentralization? Experiences of firms that have decentralized reveal that, while it is no cure-all, it may accelerate the rise of bold, gifted men to the top. Further success may well depend on increased attention to the organization's social and political environment.

DECENTRALIZATION

IN A WIDER CONTEXT

JAMES M. HUND

RESEARCH in the social sciences has ever been used as justification for specific courses of action in the cognate applied areas. Management as a synthetic art has drawn from them all, and practitioners are increasingly aware of the potential impact of the total environment surrounding their organizations. Further rationalization of a wide range of business operations is promised by the application of mathematics, for example, in operations research. One concrete example of managerial reorganization flowing from both social science research and hard necessity is decentralization.

Though several decades ago Alfred Marshall made the suggestion that ". . . it seems best sometimes to reckon

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Dr. Hund is an Associate Professor in the School of Business Administration at Emory University in Georgia. In addition to teaching Business Organization and Policies, Investments, and Corporate Finance, he has directed the Advanced Management Program for businessmen at Emory. He was educated at Amherst and Princeton and has published in-depth studies of various industries.

organization apart as a distinct agent of production,"[1] it has been in the period following World War II that we have witnessed concerted effort toward making the most of this relatively scarce factor of production.[2] A continuing interest in managerial decentralization and executive development,[3] coupled with the availability to a wider public of the three-volume series *Professional Management in General Electric*, prompts the comments made here.

Other industrial giants such as General Motors, Standard Oil (N. J.), and A. T. & T. have also decentralized,[4] but General Electric is unique in establishing its own Management Consultation Services and in doing research in the field of management. In the present context interest centers in evaluating this method of organization in the light of present social and political trends. A tremendous amount has been bet, not only by General Electric but by countless other firms, on this organizational option, and some reappraisal may be in order.

What Price Decentralization?

Necessarily such speculation involves assumptions, some heroic, others easily accepted. For example, in the first group would be the statement that managerial decentralization as an overall organizational guide will continue to be refined rather than replaced and that incipient administrators will be trained accordingly.

A corollary of this would be that the dicta of human relations, a synthetic social science, will continue to have influence in managerial circles. In the second group one would find the assumption that as a society we will not be willing to sacrifice the economies and potentials of large-scale organization in whatever areas it may be found. National security may dictate further dispersion of physical facilities, but the history of antitrust would seem to presage no significant amount of organizational dissolution. Anti-merger activities do promise, however, to slow up the rate of external growth.

The burden of these assumptions and others which might be put forward is that the need for the kinds of advantages proclaimed by the supporters of managerial decentralization will persist. The growth of information processing has led some to say that with coordination made easier recentralization can take place. To the authoritarian business executive this may be welcome news, but to those sold on the advantages of decentralization these technological advances are seen as relieving the top executive of further operating responsibilities while at the same time providing more reliable controls.

Groupism vs. Individualism

The question of individualism vs. groupism overhangs the conduct of internal business operations in firms of large size today. Its resolution may well determine the success of a policy of managerial decentralization. The real question then seems to be: "Is decentralization a hopeful economic tool while at the same time it is an already outdated social and political tool?"

Rationale of Decentralization

In embarking on programs of decentralization General Electric and other firms exhibited mixed motives, related both to internal operations and to the surrounding social and political environment. Though organizational problems often connected with increasing size and complexity were

pressing, a more subtle pressure was felt to alter the image of the corporation in the eyes of its various publics. In 1945 Mr. Cordiner explained General Electric's policy of decentralization by referring to both sets of pressures.[5]

> "The obvious reason for management decentralization was that increasing size and complexity were creating a demand for increased variety and volume of decisions and directions.
>
> "Another reason was that for some years size had been cited in some quarters as an evil in itself, and this despite the fact that many of the most important advances in living standards so obviously came as the result of the combined strength, experience and integrity of the large institutions. Endeavoring to see that the Company's bigness makes extra contributions to its customers and stockholders and that its volume and variety of facilities and activities bring extra benefits to the employees and communities in which it does business, and to the country as a whole, General Electric changed its organization in an intensive effort to combine the strength and opportunity of the large institution with the social virtues and intimacy of relationships possible in smaller organizations."

It is no accident that decentralization and human relations should have blossomed together, or that Mr. Cordiner should find himself using terms such as "social virtues" and "intimacy of relationships." It is not altogether fortuitous that these events should follow hard upon mounting evidence of the power of national unions not only to make satisfactory economic settlements but to be important shapers of public opinion in the social and political fields as well. To the extent that these latter forces were extended to the polling booth, both national and local governments have moved through appropriate legislation in response.

After the voluntary labor peace of World War II was broken, management found not only that intensive organizing efforts were being aimed at hourly workers, as expected, but various categories of so-called white collar employees were also answering the call. Should this have been unexpected?

"Durkheim Dilemma"

Before the turn of the century Durkheim took a hard and gloomy look at the impact of industrialization on society. Probably the best known element of his analysis has been referred to as the "Durkheim Dilemma." Professor Moore in his book *Industrial Relations and the Social Order*, has stated it in these terms:[6]

> "The Durkheim dilemma . . . is the fact that industrial societies depend upon a minute differentiation of social position and behavior, and therefore upon interdependence of specialized functions, but run the constant risk of collapsing into all sorts of specialized segments. Loyalties tend to follow narrow interests but therefore to shift with the context of social relations. 'Interests,' narrowly considered, will not keep a society operating; beliefs and sentiments are also necessary, and these must be in some measure unifying and not divisive."

The sense of these words is that the integrated society is not realized only

by creating a situation of mutual interdependence. But is an integrated society such as existed, we are told, in the Middle Ages a desirable ideal?

David Riesman defends in persuasive language our ideological pluralism and rejects groupism as fitting the totalitarian pattern. Backers of the latter, he claims, "believe that those others, the masses, . . . can be saved from a Durkheimian anomie only by an enforced groupism and its concomitant ideology."[7]

White Collar "Revolt"

Durkheim probably did not foresee the applicability of his analysis to white collar workers. Yet one of the most valuable contributions of research in human relations has been support of his basic hypothesis. From this it was possible to forecast the drift of all classes of employees, particularly in large organizations, to other membership units where loyalties to beliefs and sentiments could be freely expressed, and where personal longings could be at least partially satisfied.

Thus bolstered, the human relations practitioners could then recommend decentralization, already a promising economic tool, as a social and political tool. It might serve to forestall further defection of employees and some replacement, in Professor Moore's words, of interests by beliefs and sentiments. Behind this lay the assumption of an exploitable correlation between motivation and productivity which research has failed so far, unequivocably to establish.

Decentralization in Operation

Avoiding for the present any normative implications based on some particular set of values, one might well ask what the accomplishments of decentralization have been in the social and political areas. But at this point the barricades are thrown up and the defenders and critics prepare for a Donnybrook. No attempt will be made to review in detail these polemics over the whole subject of human relations.

"Cow Sociology"

Whether one calls it "cow sociology" or "a strengthening of mutual commitment to organizational goals," it is obvious that the proponents of human relations as a tool to make decentralization effective have wrought changes in organizational life.

If they had not, the criticism of their ministrations would not have been so sharp. As noted, this has been seen as a call for the return of individualism and a rejection of the various forms of groupness. Henry M. Wriston has observed that "somewhere in the 1930's, or thereabouts, rugged individualism became associated with industrial piracy, with defiance of moral checks, with exploitation of one's fellow men."[9] Whyte has declared that "current definitions of the authoritarian leader come perilously close to including anyone who has ideas of his own or who differs with others on basic policy."[10]

Organization Man Meets Decentralization

In his research on decentralization the author found that it is generally intended that the spirit, and eventually practice, of this organizational form trickle down to the man at the bench or on the assembly line, but the principal impact has been on that growing group called middle management—Whyte's organization men—from which tomorrow's business leaders will presumably emerge. What are the

social and political results of decentralization as evidenced by the actions and attitudes of this band of managers?

Within the organizational units greater powers of decision have been assumed along with responsibility for financial results of the profit centers. Because of the need for company-wide uniformity in many areas (e.g., accounting, industrial relations, pricing), most of this decision making is done within the framework of company policies. Resulting actions are in accord with existing company procedures.

Generalists

In spite of these strictures, policy-level executives testify to the development of generalists, men who can reach beyond narrow departmental considerations and take the overall management point of view. Such outcomes serve in part to answer the critics of size, but unanticipated consequences may arise to counter seeming benefits.

Explaining Philip Selznick's organizational model, March and Simon state that "delegation results in . . . an increase in the bifurcation of interests among the subunits in the organization. The maintenance needs of the subunits dictate a commitment to the subunit goals over and above their contribution to the total organizational program."[11]

This model, and those of Merton and Gouldner "attempt to show how a control technique designed to maintain the equilibrium of a subsystem disturbs the equilibrium of a larger system, with a subsequent feedback on the subsystem."[12] In other words, decentralization, coupled with human relations practices, may serve to establish beliefs and sentiments centered around the job or unit, but which are not strongly supportive of overall organizational goals. The social climate may be pleasant, intimate and secure.[13] Morale may be high, but production remains static while empire building and its consequent costs may proceed.

Staunch defenders of decentralization would probably answer that these dire predictions of organizational pathology may eventuate, but that they need not necessarily do so if skilled people are in charge.[14] Perhaps so, but the genius of an Alfred P. Sloan, Jr. is indeed rare, and a cadre of persons of even lesser abilities is far from equal to the task assigned it. To be presented with a kit of tools is one thing; to be taught how to use them quite another.[15] Undoubtedly it is the poor carpentry turned out by some practitioners of the art which is partially responsible for the unsavory reputation in some quarters of both decentralization and human relations.

Key to the Future?

Yet development of these skills is seen as a paramount necessity. General Electric regards decentralization as "the key to the future." In its recent reorganization, Standard Oil (N. J.) affirmed its belief in decentralization, extending delegation even further than in the past.[16] It would seem to be heeding one authority who has called on the board of directors to "accept a responsibility for the nurturing of the cooperative skills of its subordinate managers," adding that "without it decentralization cannot succeed. And without decentralization an organization can neither grow nor continue successfully to live."[17]

Enthusiasm for means must, however, be tempered with concern for ends. "Consider the abstractions that are so much taken for granted as

good—such as consensus, co-operation, participation, and the like. Held up as a goal without any reference to ends, they are meaningless . . . It (participation) is a means, not an end, and when treated as an end, it can become more repressive than the unadorned authoritarianism it is supposed to replace."[18]

The Wider Context

William S. White has recently gone so far as to lament the passing of appreciation for the concept of power, both in national life and in our individual lives.[19] This is a facet of the wider context in which efforts at decentralization must be considered. He states:

> "The qualities now most admired are surely not those of strong personal character, of individualism. Rather, they are those muted qualities associated with a carefully merged and somewhat ambiguous thing called a "team." And it is not merely in government that "the team" operates; it also pervades private industry, science, and most other fields."

Mr. White further inveighs against the dominance of what he calls the "anti-Power Elite," to borrow from C. Wright Mills. The hard realities of business and government, and that world in between usually ministered to by Chambers of Commerce, demand the use of power if in many cases shabby compromise is not to win out.

This is not meant to be a defense of the benevolent despot or a return to paternalism. Rather, it is to point out that team effort does not guarantee good results, but merely guards against bad. "Free debate," in whatever field it may be found, "does not guarantee the emergence of truth; but it does safeguard against the enthronement of error."[20] These precepts must be well remembered by those pursuing decentralization with its bedfellows of human relations, cooperative participation, and the team approach.

The question returns, then, whether the pressures of the environment external to the organization combined with those of managerial collectivism are formidably arrayed against the emergence of just the kind of self-possessed, decisive and foreward-looking managers so widely desired and so desperately needed. The burden of this piece is to cast grave doubt.

Countervailing Power of Unions

In the social and political spheres, decentralization came too late to accomplish the ends set for it. It was Galbraith who brought the issue into sharp focus in the "concept of countervailing power." Decentralization and human relations did not come soon enough to forestall the formation of powerful labor unions which have in recent years appealed to white collar as well as blue collar workers. In spite of managerial efforts, this may continue. Opinion Research Corporation of Princeton in a survey of scientists and engineers, many of whom were rated as "presently or potentially most valuable" of their companies' scientific personnel, found a good deal of discontent about company management.[21]

Not only has the union been to some extent a social refuge, it has provided the means to political power which is being progressively exploited not only through big government, but government with a social conscience more sensitive than that in the past evidenced by big business. Management

is keenly aware of this today, as Mr. Cordiner shows when he says:

> "The important thing is that industry must not fight labor, but intelligently learn to work harmoniously with it. This is a problem not only for us but for the men of labor, who are still inclined to fight and shout, to distort economic truths and make political alliances."[22]

Oswald Knauth in reviewing Professor Selekman's recent book, *A Moral Philosophy for Management*, has also noted the changed environment. He finds that labor abetted by government still voices "The discredited Marxian doctrines . . . even though the position of management has in fact turned a complete circle. If anyone is dominant today, it is union labor leaders, and they are misusing their power. In addition, they are closely seconded by the new powers of government."[23] The slow drift to collectivism in our national institutions and attitudes, coupled with the development of intra-organizational groupness which is somehow regarded as anti-collectivist, seems hardly a nourishing soil for the seeds of decentralization.

One cannot deny the part played by representatives of management today in the non-commercial aspects of community life, though one sometimes suspects it may be for commercial reasons. More and more top executives are freeing themselves of operating responsibilities so that they can participate more fully in such activities. Prominent executives such as Charles Percy are becoming involved on the firing line of national politics, no longer content to limit their support to the checkbook. Countless firms are taking advantage of the several high level executive development or advanced management programs being conducted across the country. All of these efforts are to be roundly commended, but even deeper and more widespread involvement is crucial for shaping an external environment congenial to and supportive of the aims of decentralization.

Conclusions

In their attempts to use efficiently a scarce economic resource and to add significantly to this resource, managements in the larger enterprises have presented themselves with a dilemma. Limited by the necessity of showing profits to stockholders, they cannot offer the kind of security promised by munificent government, yet they must provide enough to prevent further drift toward eventual nationalization of industry and to keep the growing ranks of managers motivated toward what they hope are the goals of their organizations. The rapid growth of fringe benefits is evidence of this, though from what has been said above it should be clear that financial security is only one facet of what is meant in this context by security.

Incubator for New Leaders?

There is at the same time the inconsistent expectation that in spite of the pressures for conformity and the collective life both within and without the organization, sufficient men of unusual ability, individuality and equipped with leadership skills will rise to be recognized. Decentralization, properly administered, is highly regarded by many as one administrative arrangement calculated to distill from the ranks of middle management the men willing to reject the immediate comforts of personal and family life and the blandishments of a secure spot in middle class suburbia for the chances

at a partnership or a vice presidency.

They must be super organization men, as suggested by the hero in John O'Hara's novel *From the Terrace*, not content merely to mend the fences of satisfying personal and social relationships, hoping that promotions will come on schedule as they seem to do in certain forms of government service. They must obtain results for their firms. These are most easily measured in dollars, and securing them may involve conflict and tension in some relationships and resulting unpopularity.

The tenor of the arguments presented is not to suggest we discard managerial decentralization as an organizational tool, but to say that in the present and developing social and political climates too much may be expected of it. Persuasive pleas for individualism with emphasis on initiative, imagination and the courage to go against the grain are being made. These may have but little appeal in the ears of the individual who "starved" during the thirties, and they may lack challenge for those nurtured by the armed services and the Veterans Administration for a prolonged period.

If one grants that past and present debilitating environments can be overcome, will those who do so be permitted to be more than an extension of the mind of top management? Will they really be tempted to scale the pyramid ahead of their fellows? Can they employ human relations in the interests of efficiency and productivity and still not be accused of manipulation?

These are some of the important challenges of decentralization. True, perfectly random behavior leads to chaos, but controlled behavior is tyranny and totalitarianism. The middle road must permit areas of tolerated conflict, and encourage independent judgment and free inquiry. This is not easy. Management would do well, however, to depend not on the magic of an organizational form to meet these challenges, but rather to develop means of moderating the social and political climates which are so inextricably bound to the economic.

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FRAMEWORK FOR
MARKETING
STRATEGY

HARRY ALLISON

It's up to the marketing staff to maximize a firm's total revenue net of selling costs, and this often calls for statistical as well as sales know-how, for many factors must be equated and others, such as fixed and variable costs, juggled to produce the most advantageous net possible. Outlined here is a framework within which to view marketing situations and some strategies to help keep the percentages in your favor.

THE purpose of this paper is to accent both the need for a systematic approach to marketing management decision-making and the need—in each decision-making situation—for a complete consideration of the many variables involved. The emphasis is on how marketing decisions should be made rather than on how they are, in fact, made; yet, it is hoped that the former is kept parallel enough with the latter so that the marketing practitioner does not feel uncomfortable.

The ideas presented are not particularly new. The writer has drawn heavily from an article by P. J. Verdoorn[1] and also from writings by Wroe Alderson,[2] Albert W. Frey,[3] Alfred R. Oxenfeldt,[4] D. M. Phelps, and John A. Howard.[5] Comments of colleagues and students have also contributed to all sections of this article.

Briefly, the framework views the job of the marketing staff as that of identifying all relevant marketing alternatives confronting the firm, of choosing from among these alternatives the particular alternative at each output level which best satisfies the goals of the firm, and of carrying out the marketing side of the firm's final plan of action as efficiently and effectively as possible.

The process of choosing among the relevant alternatives involves the marketing staff in an attempt to maximize long-run total revenue net of selling costs at particular output levels, given the outside-imposed and firm-imposed restrictions on the marketing staff's actions.[6] This requires that optimum use be made of those factors which both affect total revenue net of selling costs and are under the control of the firm.

To achieve optimum use of these firm-controlled factors, the marketing staff must take into account not only the effect of the firm-controlled factors on each other, but also the impact of those factors which affect total revenue net of selling costs and are in some way influenced, but not controlled, by the firm and the effect of those factors which affect total revenue net of selling costs but are neither controlled nor influenced by the firm.

Optimum use of each firm-controlled factor which affects total revenue net of selling costs implies that—within the outside-imposed and firm-imposed restrictions—the marketing staff allocates the firm's marketing efforts in such a way that all expenditures on marketing are put to the best possible use. This, in turn, requires that the

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Dr. Allison is an Assistant Professor at the schools of Business Administration at the University of California, Berkeley. His field is Marketing. He was educated at Pennsylvania State and Harvard Universities.

marginal effort expended on each controlled factor returns the same marginal revenue net of selling costs per dollar spent and that no better obtainable combined use for the controlled factors exists at the particular levels of output.

The optimum output level for the firm is determined by equating marginal revenue net of selling costs to marginal cost of production. When there are no effective restrictions on the actions of the marketing and production staffs and when the above equalities are realized, each controlled factor in marketing and production is exploited to the point where the marginal contribution net of all costs—marketing and production costs, including the cost of the factor itself—of the last dollar expended on each factor is zero.

Identifying Alternatives

Selected marketing plans can, of course, be no better than the best of the identified alternatives. Whether the specific group of alternatives under consideration for a particular output level includes the optimum marketing plan for that level depends on the marketing intuition and imaginative reasoning of the individuals involved; on their own past experience; on their observation of current and former practices of the firm, competitors, and firms in other industries; and on the time and resources devoted to devising plans. The availability of both time and resources for use in determining alternatives is frequently limited. Even if not, at some point, the benefits anticipated from any further search for alternatives will no longer justify the cost.

Restrictions Imposed by the Firm

Firm-imposed restrictions on the marketing staff's freedom to choose among the alternatives it does identify may arise from goals or objectives established for the firm by top management, restrictions set by top management on the manipulation of the firm-controlled factors affecting total revenue net of selling costs, or the past activities of the firm.

The firm's goals—The goals or objectives of the firm may range from unqualified short- or long-run profit maximization to goals which by no means need result in either maximum short-run or maximum long-run profits.[3]

Where non-profit-maximizing goals are involved, the marketing staff must first sort the identified marketing alternatives to remove those which do not meet the requirements of the non-profit goals of the firm. Alternatives satisfying the non-profit goals are then sorted by their long-run profit contribution with the marketing staff selecting the plan—for each output level—which seems likely to yield the largest total revenue net of selling costs over the long run.[4]

This view sees the goal of the firm not as maximum long-run profits per se, but rather as long-run profits that are as large as possible, given the restricting effect of any and all non-profit goals instituted by the firm's top management. In such context the non-profit goals become simply a part of firm-imposed restrictions on the actions of the marketing and/or production staff. Should the marketing staff find certain non-profit goals too restrictive, it can always appeal to top management to relax the restrictions. However, the marketing staff does not con-

trol the final decision on the goals. Therefore, at some point, it must accept the goals established by top management whether it likes them or not.

Limits on the manipulation of firm-controlled factors—The dictates of top management with regard to manipulation of firm-controlled factors which affect total revenue net of selling costs may be another restriction on the marketing staff. Such restrictions could be applied through any of the controlled factors cited later in this paper. A few examples of restriction by top management are (1) setting maximum or minimum prices beyond which the marketing staff cannot go, (2) prescribing or proscribing certain channels of distribution, or (3) insisting that advertising and/or personal selling expenditures not go beyond a certain level.

Past activities of the firm—Further firm-imposed restrictions on the actions of the marketing staff arise from past activities of the firm. First, there may be a positive or negative prepossession toward an identified alternative as a result of the firm's previous experience with that alternative or a parallel version of it.

If the firm is reasonably prosperous, its existing marketing policies create a resistance to change simply through their past acceptance and current performance. These existing policies are tried and proven and, as such, hold a degree of attractiveness over the uncertainty of even the most promising of the other alternatives. Likewise, marketing policies which have failed in the past carry a stigma which heavily discounts their current and future consideration, regardless of a change in the conditions involved in their failure.

Secondly, past activities have brought the firm into the current period with a number of commitments which are binding for the present and carry an actual or implied obligation for the future.[9] Such commitments can be changed if there is sufficient time. However, the change may involve absorbing losses on some sunk costs, buying the firm out of certain long term obligations, and/or accepting some loss of goodwill from those who feel that implied obligations are being disregarded. The situation parallels the production problem of obsolescence in which case the firm finds itself with existing plant and equipment that falls short of the ideal.

Outside-imposed Restrictions

The marketing staff finds its range of choice among alternatives limited by forces outside the firm as well as by its own top management. Outside-imposed restrictions may take the form of insufficient time, government regulation, industry environment, and rationing of inputs.

Insufficient time—The time restriction has its first impact through limiting the amount of effort the marketing staff can expend in searching for, and in evaluating, alternatives. The result is that fewer alternatives are identified, fewer receive detailed evaluation, and less extensive analyses are given to those that are evaluated.

The other effect of the time restriction is to make some of the identified alternatives unobtainable simply because it is impossible to complete at least one necessary element of those alternatives within the time available. Such situations can best be described by the term short-run.

Government regulation — Various types of local, state, federal, and foreign government regulations restrict the actions of the marketing staff in

many and varied ways. Licensing requirements, pricing restrictions, foreign exchange regulations, control of advertising appeals, and restraints on relationships with customers, agents, and competitors, are just a few of the many examples that could be cited here.

Industry environment—Various industry practices growing out of the market structure and historical experience of the industry may have acquired sanction through strength of usage, or been adopted through informal or formal agreement. Trade discount structures and channels of distribution often fall into the first category, frequency of model changes and pricing into the second, and advertising copy into the third. While in these cases the firm can adopt marketing alternatives which take it outside the industry pattern, the demands of customers, pressure of competition, and the threat of actual chastisement by industry leaders heavily discount such alternatives.

Rationing of inputs—At times the marketing staff may have to set aside otherwise desirable alternatives because the firm, through no fault of its own, is unable to secure the particular inputs needed—such as financing, materials, or personnel, to carry them out.

Some outside-imposed restrictions classed as rationing of inputs might also be viewed as arising from time restrictions. For example, if enough time were available, additional salesmen could be trained to meet the requirements of any proposal. Also, in some cases of material shortages, additional time may be all that is needed for suppliers to expand their plants and equipment to fill the firm's orders for materials without unreasonable delay.

Most outside-imposed restrictions are beyond the control or the influence of the firm's top management, and must, therefore, be accepted by the marketing staff as unmodifiable. The nature of certain industry practices and certain government regulations—particularly those designed specifically for the industry of which the firm is a part—can, however, frequently be influenced by the firm itself. If the firm is in a dominant position within its own industry, it may even control industry acceptance or rejection of particular practices. If nothing else, it is certainly the firm's top management who must decide how closely the firm will adhere to specific industry practices.

Revenue Net of Selling Costs

As indicated earlier, the identified alternatives satisfying both firm-imposed and outside-imposed restrictions must be evaluated at each output level in terms of their expected total revenue net of selling costs. Such evaluation requires extensive consideration of all factors affecting total sales and any of the selling costs. This is no small task, as the range of such factors is extremely broad. It seems particularly useful in marketing decision-making to group the many and varied factors affecting revenue and selling costs on the basis of the degree of control held over them by the firm. Such a classification results in the following categories: (1) factors controlled by the firm, (2) factors influenced but not controlled by the firm, and (3) factors neither influenced nor controlled by the firm.

It will be noted that these groupings of factors affecting total revenue net of selling costs include many of the considerations brought up earlier in discussing firm-imposed and outside-

imposed restrictions. There, these factors entered only when they were fixed values set by internal or external forces and, as such, were given conditions within the bounds of which the marketing staff had to operate. The present section includes these considerations when they do not have fixed, predetermined values but rather are variables whose value is either under the control of the marketing staff or whose value must be assessed or predicted by the marketing staff as a part of the process of evaluating the impact of alternative marketing programs.

Firm-Controlled Factors

The firm-controlled factors affecting total revenue net of selling costs are of primary interest because these are factors that the marketing staff can, and does, manipulate in trying to evolve optimum marketing programs for specific levels of output.

They include advertising, assortment, channel(s) of distribution, geographic outreach, group(s) of customers to whom the firm tries to appeal, location(s) for the firm, marketing research, organizational structure and administrative framework for the marketing functions, personal selling, physical distribution, pricing, product design features, quality level, sales promotion including miscellaneous devices, and services.

This list of controlled factors is not intended to be exhaustive or to cite only areas of equivalent importance. Rather, it is intended to point up the primary areas of marketing decision. The controlled factors—and also the factors in the two groupings which follow—have been listed alphabetically in order to avoid the almost impossible task of assigning a ranking of relative importance to each factor.

Each category has a number of subparts. For example, advertising would involve decisions about such things as the total amount to be spent on advertising; copy content; media selection; timing of campaigns; use to be made of cooperative advertisements and promotional allowances; allocation of the advertising budget according to type of final customer, channel agency, and geographic area.

There are many opportunities for disagreement concerning the most appropriate assignment of the subparts. In the case of advertising, the aspect of the geographic allocation might just as well be included under the category of geographic outreach, allocation by type of final customer with the category of the group(s) of customers to whom the firm tries to appeal, and the allocation by channel agency and the use to be made of cooperative advertisements and promotional allowances with the category of channel(s) of distribution. The essential thing is that all subparts are recognized and accounted for, regardless of the category under which they are listed.

Objections may also arise because some readers prefer to take some of the aspects given only sub-category status in the above classification and elevate them to full-category status. Other readers may want to drop certain factors from the listing presented and relegate them to sub-category status. For example, the group of customers to whom the firm tries to appeal could be viewed as the result of decisions on services, quality level, product design features, pricing. Or a decision with regard to customer groups could be viewed as largely predetermining

the services, quality level, product design features, pricing, etc.

The position taken here is that none of the listed controlled factors should be relegated to such a subordinate position that its use in a particular marketing program is arrived at without direct consideration. All the cited controlled factors should be recognized as specific areas of decision involved in designing marketing programs, and as such each should be dealt with directly and not piecemeal through the summation of decisions on other controlled factors.

For the purpose of manipulating the firm-controlled factors, it is essential, however, that the interdependence of the controlled factors be recognized—what the marketing staff does with one of these factors affects the performance of the effort expended on the others. Likewise, it needs to be recognized that most of the controlled factors are to some degree a substitute for each other, e.g., a price reduction may be used instead of an increase in advertising or personal selling expenditures or a higher cost location in place of some of the advertising outlays.

Firm-Influenced Factors

The influenced-but-not-controlled factors encompass all those areas in which the firm's own actions may well create reactions that in turn have an impact on the firm's total sales and its selling costs. Factors influenced but not controlled include such categories as:

- Actions of producers of substitute and complementary goods
- Cooperation of the independent channel agencies selling the firm's products
- Number of competitors
- Performance of the firm's employees
- Reactions of buyers
- Technology affecting use of the firm's products

The most sensitive factor in the above grouping is that of the actions of producers of substitute and complementary goods, in particular the actions of competitors. No marketing alternative can be evaluated without making allowance for the impact of the counterstrategy that the alternative is likely to elicit from competitors. The simplest counterstrategy for competitors frequently is to try to parallel the firm's own actions; however, competitive marketing staffs have at their disposal all the firm-controlled factors mentioned earlier, and may choose to manipulate any one, or any combination, of them in trying to hit upon the most effective counterstrategy.

The category of cooperation of the independent channel agencies selling the firm's products includes such things as compliance with pricing recommendations, participation in promotional campaigns, stocking of minimum inventory, and providing repair service and repair parts. The number of competitors is influenced primarily through the firm's pricing and advertising policies although any of the controlled factors might be manipulated in such a manner as to close out—or make unattractive—opportunities to potential competitors.

The performance of the firm's employees involves such considerations as morale; competence—a result of recruiting policies, training programs, and experience; stimulation of the sales force through leadership and appropriate compensation; proper control

and coordination procedures; and lack of disruptions such as strikes.

In regard to the reactions of buyers, the firm, of course, hopes to influence buyers in a positive way toward itself and in a negative way toward competitors. Advertising and personal selling are the most direct factors for realizing this, but actually all the controlled factors are manipulated with the goal of influencing buyer reactions in a manner favorable to the firm.

Technology affecting use of the firm's products is influenced through the firm's own research on additional uses and through what encouragement or discouragement the firm's marketing program creates in regard to research by others either to find additional uses for the product or to create substitute products.

Outside Factors

A number of factors outside both the influence and the control of the firm have an impact on the absolute and the relative effectiveness of given levels of the firm-controlled factors. These same factors also affect the manner in which the influenced-but-not-controlled factors react to various manipulations of the firm-controlled factors.

Changes in these reactions, in turn, have a secondary impact on the effectiveness of the firm-controlled factors. Thus, in evaluating alternatives, allowance must be made for both primary and secondary effects of the anticipated levels of the neither-influenced-nor-controlled factors. This group includes acts of God, buyer expectations with regard to the future level of economic activity, demand for complementary items and items of which the firm's product is a part, general level of economic activity, government action in foreign policy and in domestic monetary and tax matters, population characteristics including distribution by age, education, ethnic background, geographic area, income, etc., population size, and standard of living.

Droughts, hail storms, or unseasonal frosts may destroy or damage certain crops so that sellers of packing and canning supplies find little market response regardless of how firm-controlled factors are manipulated in the marketing program. Furthermore, under these conditions, the relative effectiveness of increased personal selling versus a price concession may be somewhat different than in a normal crop year.

In addition, the bleak prospects for sales may have a negative impact on the morale of the sales force and, through this, a secondary negative reaction on the effectiveness of the personal selling factor. Likewise, different buyer expectations, such as optimistic versus pessimistic outlooks of industrial, commercial, or household buyers with regard to the future level of economic activity, generally call for different marketing approaches, if a firm's marketing staff is to achieve the maximum feasible total revenue net of selling costs for a given output level.

An example of the impact of the demand for an item of which the firm's product is a part would be the impact of the demand for new housing on the sales of a firm manufacturing bathroom fixtures. The absolute and relative responses to alternative manipulations of the controlled factors might vary considerably with the demand for new housing. Also, changes in the standard of living might progressively shift a firm's product from the category of a luxury toward that of a necessity. Such a change would have reper-

cussions on the effectiveness of the different firm-controlled factors.

Conditions To Be Met

In choosing from the various alternative manipulations of firm-controlled marketing factors at a given level of output, the marketing staff should not seek the plan with the lowest selling costs as such a plan usually produces relatively little total revenue; nor should it seek the plan with the highest total revenue as such a plan usually has exceptionally high selling costs. The goal, rather, is to sort the feasible alternatives at each output level to determine which alternative yields the maximum total revenue net of selling costs for that output level.

If no one plan satisfies both the lowest selling costs and the highest total revenue criteria for a particular output, it becomes very probable that the plan chosen on the basis of maximum total revenue net of selling costs will be neither the minimum selling costs plan nor the maximum total revenue plan for that output. Of course, once a plan is chosen as the best of the feasible alternatives at a given output level, the marketing staff should be prepared to execute that plan at the lowest possible cost and in a manner which would maximize the total revenue realized from that plan. In short, the marketing staff is responsible for carrying out chosen plans as efficiently and as effectively as possible.

Marginal Revenue Net

In manipulating the levels of the firm-controlled factors for any particular marketing alternative, the marketing staff should equalize the net return over selling costs to the marginal effort expended on all of the firm-controlled marketing factors. This net return to the marginal effort can be referred to as the marginal revenue net of selling costs and is defined as the change in total revenue minus the change in all selling costs—including changes in the cost of the marketing factor being manipulated—associated with the increasing sales by one unit. If all controlled marketing factors except one are held constant in securing the one unit increase in sales, the marginal revenue net of selling costs from the additional unit of sales can be viewed as the return to the marginal effort expended on a particular controlled marketing factor. Unless the marginal revenues net of selling costs are equal for the last dollars spent on advertising, location, personal selling, services, etc., at a particular level of output, the firm's total revenue net of selling costs—and, therefore, the firm's profits—for that output level can be increased by transferring marginal dollars from the controlled factors yielding the lower marginal return into the controlled factors yielding the higher marginal return.

For example, if the last dollar spent on advertising has a marginal revenue net of selling costs of 50 cents, while the last dollar spent on personal selling returns only 25 cents, total revenue net of selling costs can be increased by taking marginal dollars out of personal selling and applying them to advertising where the net return is higher. As the amount spent on advertising is increased, the marginal revenue net of selling costs of dollars spent on advertising will decline (presumably the richer return areas have already been exploited so that additional expenditures are confronted with declining returns). Conversely as the amount spent on personal selling is reduced, the marginal revenue net of selling costs

of dollars spent on personal selling will increase (the marginal dollars are removed from the least lucrative areas so that the marginal revenue net of selling costs for the remaining dollars is higher).

Conceptually, this transfer of effort from the low-return variables to the high-return variables would pay dividends as long as inequalities remained among the marginal revenues net of selling costs. In actual practice, of course, expenditures on advertising, rent, personal selling, services, etc., would not be made in dollar increments even at the margin but rather would be varied in chunks of lump sum amounts. Thus, at best, the equality condition for marginal revenues net of selling costs could only be approximated.

Spreading Costs and Revenues

It should be noted that the period of time used in the calculation of the marginal revenue net of selling costs associated with a specific change should be sufficiently long to give a reasonable spreading out of any one-time marketing costs that may be involved in the change, or else only a realistic part—rather than all—of the one-time costs should be charged against the change.

This same consideration would hold for the revenue data as well. The initial impact on revenue of a specific change may be either extremely light or extremely heavy relative to the longer run impact. In such situations again, the period of time used in the calculation of the marginal revenue net of selling costs should be long enough to give a reasonable leveling out of the initial reaction, or else the original impact data should be adjusted for the failure to do so.

Balanced Program

While the condition of balanced effort as reflected in the equality of the marginal revenues net of selling costs for all of the firm-controlled factors is a necessary condition for maximizing total revenue net of selling costs at any output level, it is not in itself sufficient to assure that the desired maximum is achieved. Poor marketing programs can be balanced so that the marginal revenues net of selling costs are equal just as in the case of good marketing programs.

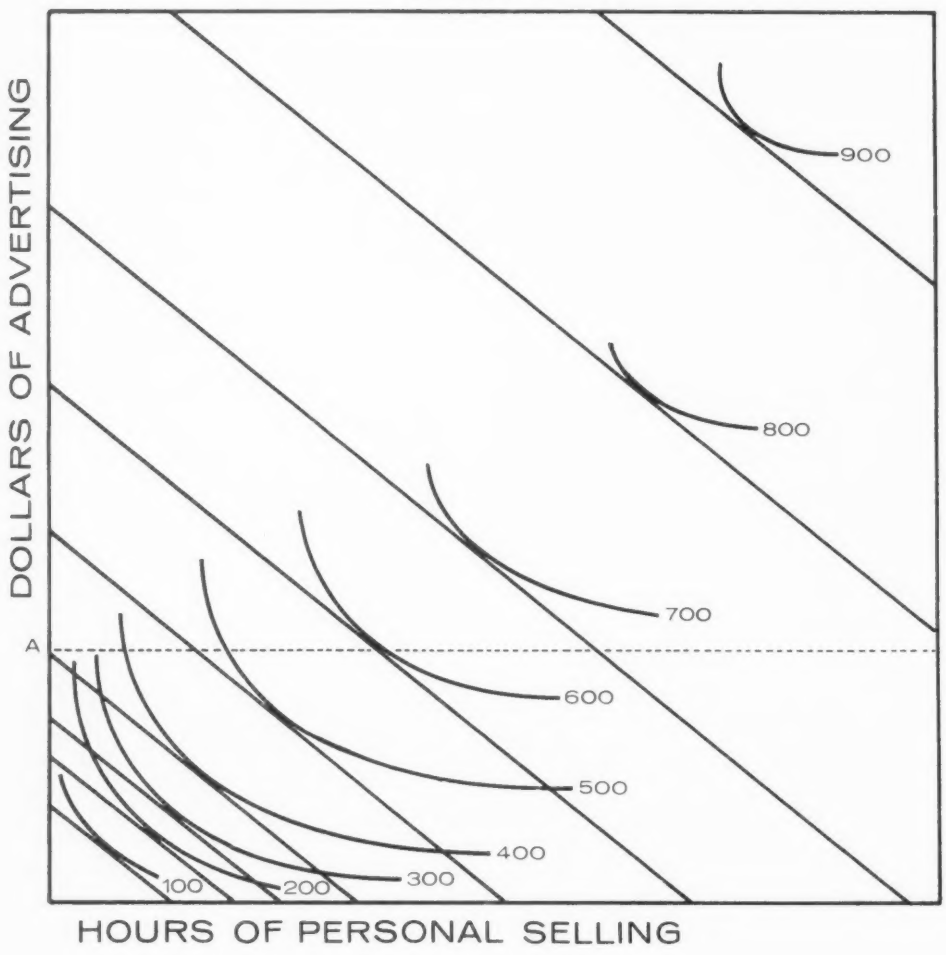
Thus, not only should a balanced program be achieved at each output level, but it should be the best possible balanced program for that level of output. In order to maximize total revenue net of selling costs for a particular output level, not only must the condition of equal marginal revenues net of selling costs be attained for all controlled marketing factors, but also it must not be possible to increase the total revenue net of selling costs for that output level by altering the nature of the marketing program through changing any one controlled factor or combination of controlled factors.

Sales Engineers

From the perspective of what is to follow, the marketing staff is looked upon as a group of sales engineers working with a sales function to produce dollars of revenue net of selling costs just as production engineers are traditionally viewed as working with a production function to produce units of product. The sales inputs are the firm-controlled marketing factors.

These have a cost to the firm just as have production inputs.[10] The marketing staff's performance is measured in dollars of total revenue net of selling

CHART I



costs. It is charged with manipulating the firm-controlled marketing inputs within the context of known marketing techniques in a manner that realizes the maximum long run revenue net of selling costs at each output level within the restrictions, if any, which are imposed by the outside forces or by the firm itself.

While the task of the marketing staff and its approach to that task seem to parallel the production situation, the marketing side of the firm is not nearly as neat conceptually as the production side. Factors outside the direct control of the firm have a much greater significance for marketing. Furthermore, the impact of the many revenue affecting factors—including the firm-controlled factors—on total revenue net of selling costs can be assessed much less accurately than can the impact of production factors on output and production costs.

The Sales Function

In Chart I a number of equal-sales contours representing progressively larger sales have been determined, and the equal-cost lines tangent to each

have been inserted thereby identifying the economically efficient way to sell each of the indicated levels of output.[11] It should be noted that for any one set of contours, such as that given in Chart I, a number of things are taken as being constant at particular levels. They are (1) all firm-controlled marketing factors, other than the two being manipulated, (2) all of the neither-influenced-nor-controlled marketing factors, and (3) the initial level of all of the influenced-but-not-controlled marketing factors. The impact of any changes induced in the level of the influenced-but-not-controlled factors through manipulating the two controlled factors is incorporated into the estimated values for the sales level contours.

For low levels of sales the equal-sales contours would intersect both of the illustrated axes, as these lower levels could be attained either with relatively large amounts of advertising and no personal selling or with relatively large amounts of personal selling and no advertising.

At high levels of sales where large amounts of advertising and personal selling are being used, the equal-sales contours may begin to turn back on themselves as either extreme of the contour is approached. For example, the firm's marketing staff might find it had so saturated the market in which it was working with personal selling that it was realizing a negative unit-of-sales return to marginal increases in personal selling effort. Therefore, it would be forced to increase advertising outlays along with increases in the personal selling outlay in order to remain on a given equal-sales contour, that is, in order to overcome the negative impact from the increased calls of the sales force.

Naturally, the marketing staff would not be interested in pushing any controlled marketing factor into the area where marginal increments had a negative return unless it was required to do so by firm-imposed restrictions—for instance, using a certain size of sales force in order to give employment to all of the relatives of top management.

A change in the value of any of the factors assumed to be constant changes the illustrated sales surface. Thus, given the many variables taken to be constant, the realistic range of values they might have, and the resulting numerous possible combinations that might arise, there is literally a multitude of the illustrated advertising and personal selling relationships.

The proportion of such relationships having significance for a particular decision-making situation is usually relatively small, since the marketing staff is only interested in the more promising of the feasible levels for the controlled factors and in the more probable of the possible levels for the influenced-but-not-controlled and the neither-influenced-nor-controlled factors. Taking a relatively small proportion of a multitude of relationships, however, still yields a sizable number of relationships that are relevant to any one particular decision-making situation.

There is some further help in that, even within a particular relationship, ranges of the two observed variables are eliminated from consideration either because such levels are not feasible or because they hold little or no promise.

Furthermore, while the equal-sales contours are drawn as continuous relationships in the theoretical cases, the marketing staff generally finds it suf-

ficient—even within the more promising ranges of the variables—to evaluate a series of discrete points. The latter occurs either because finer gradations are not feasible owing to the imperfect divisibility of one or more of the inputs or because it is sufficiently accurate to use these points as benchmarks and interpolate between them in order to get the continuous curve.

Total Curve

The series of tangency points between the equal-sales contours and the equal-cost lines in Chart I supply the data for deriving the total-revenue-net-of-selling-costs curve. Each tangency point represents a particular level of sales achieved at some indicated selling cost to the firm. The sales level multiplied by the price per unit—taken as fixed in this example—minus the sum of the cost indicated by the appropriate equal-cost line and the cost of the other selling factors taken as fixed for the two-variable analysis yields the total revenue net of selling costs for that level of output. Repeating the process over the range of sales levels and plotting the resulting dollar data against output produces a curve similar to that shown in Chart II.

The total-revenue-net-of-selling-costs curve may initially rise at an increasing or decreasing rate depending upon whether increasing returns occur.[12] However, as the sales level increases, the curve eventually begins to rise at a decreasing rate, reaches a peak, and then falls toward—and finally through—zero. Unless firm-imposed restrictions force the marketing staff to do so, it is not going to be interested in plans carrying sales beyond the peak point of this curve, since in the falling range the marginal revenues net of selling costs for the manipulated factors are negative.

CHART II

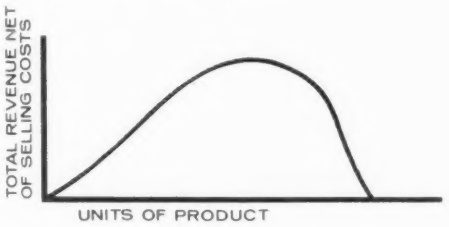
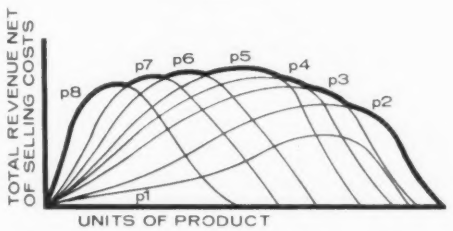


CHART III



Incorporating Additional Inputs

A third firm-controlled marketing input can be graphically accounted for by developing a sales function—like that in Chart I—for each of the relevant levels of the third input. The tangency points on each of these sales functions can then be reduced to individual total-revenue-net-of-selling-costs curves by the process described above.

These curves can, in turn, all be plotted on the same set of total dollars versus output axes as shown in Chart III. The highest sections of the resulting family of curves then trace the appropriate total-revenue-net-of-selling-costs curve for the three-input relationship. If fine enough gradations of the third variable are used, the high points of the individual curves should trace a smooth, continuous curve. Otherwise, the curve derived from the high points would have a scalloped effect as shown in Chart III.

This approach is especially useful

with those variables that are particularly difficult or clumsy to treat as one of two manipulated variables generating a sales function such as was done earlier in the example dealing with advertising and personal selling. Price is one of the several variables that fall into this category. Thus, in Chart III, each total revenue-net-of-selling-costs curve can be viewed as representing the optimum combinations of advertising and personal selling for selling various quantities of the product at a particular price level.[13]

A fourth firm-controlled marketing factor can be incorporated by constructing a family of curves such as that shown in Chart III for alternative levels of the fourth factor. These several families of total-revenue-net-of-selling-costs curves can then all be plotted on the same diagram with the highest sections of these curves being taken to make up the total-revenue-net-of-selling-costs curve for the four-input case.

An example could be developed using the four inputs, advertising, personal selling, price, and channel of distribution. For each alternative channel a family of total-revenue-net-of-selling-costs curves reflecting varying combinations of advertising, personal selling, and price could be derived as discussed in the three-variable case cited. In most situations the channels of interest are restricted to two or three possibilities so that the task would not be so formidable as it might seem at first thought.

It is just a short step from the above four-variable example to the multivariable case where, rather than develop the complete sales functions and the resulting families of total-revenue-net-of-selling-costs curves, the marketing staff intensively evaluates only what appear to be the most relevant alternative combinations of the firm-controlled marketing factors.

The total-revenue-net-of-selling-costs curve is then represented by a disconnected series of points, each of which identifies the maximum total-revenue-net-of-selling-costs plan for a specific output level. The basic reasoning patterns of a sales function and its companion total-revenue-net-of-selling-costs curve still apply in such a development. The chosen marketing alternatives lie on a multi-dimensional sales surface at points of tangency between equal-sales and equal-cost relationships with the selection process following the same decision rules as in the less complex examples sketched above.

Profitable Level of Output

If no outside- and firm-imposed restrictions exist, or if, at least, those that do exist are ineffective in the sense that they do not prevent either the marketing or the production staff from reaching desired alternatives, then all points on the total-revenue-net-of-selling-costs curve and on the total-production-cost curve will represent balanced marketing programs and balanced production programs. Given no effective non-profit-maximizing firm-imposed restrictions, top management would then select the output level where marginal revenue net of selling costs equaled the marginal cost of production.[14]

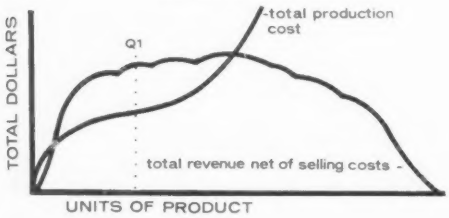
Since, under the above conditions, both the marketing and production programs would be balanced within themselves, the chosen level of output will be a position at which the marginal revenues net of selling costs are equal for all firm-controlled marketing factors, the marginal costs are equal

for all firm-controlled production factors, and the marginal revenues net of selling costs are equal to the marginal costs of production.

At this point, all firm-controlled factors are fully exploited to where the last dollar spent on each just returns a dollar—i.e., for each factor the marginal contribution net of all costs (marketing and production, including the cost of the factor itself) is equal to zero.

When the total-revenue-net-of-selling-costs curve and the total-production-cost curve are both smooth instead of scalloped, the above equality position takes place where the slopes of the two curves are equal. If one or both of the two curves is scalloped instead of smooth, the equality of marginal revenue net of selling costs and marginal cost of production, may occur more than once and, therefore, may not be a sufficient condition in itself. In such cases the profit maximizing solution is at the marginal equality point where the total-revenue-net-of-selling-costs curve lies furthest above the total-production-cost curve.

CHART IV



Marginal Equality Point

The point of marginal equalities must lie at or before the peak of the total-revenue-net-of-selling-costs curve. After this curve begins to turn down, the firm is confronted with declining total revenue net of selling costs and rising total production cost (average production cost may be falling because of economies of scale, but total production cost would be rising) so that profit declines.

Actually as a result of rising total production cost, the profit maximizing solution is likely to occur at an output level prior to the peak of the total-revenue-net-of-selling-costs curve rather than at the peak itself. Such a solution is presented in Chart IV for the case of a scalloped total-revenue-net-of-selling-costs curve and a smooth total-production-cost curve.

The Impact of Restrictions

In the examples which follow, it is always assumed that the stated restrictions are the only restrictions on the manipulation of the firm-controlled marketing and production factors. Furthermore, it is assumed that the marketing and production staffs always strive (within the limitations of any restrictions on their actions) to maximize total-revenue net of selling costs at each output level and to minimize total costs of production at each output level. Thus, when the discussion centers on the problem of balance within either the marketing or the production program, it is assumed that the discussion of balance refers to balance within the best obtainable marketing or production alternative at a specified level of output.

Balance Isn't Everything

As indicated earlier, even poor alternatives can be balanced. Balance, therefore, is not of such high merit that the firm will select a balanced but poor marketing or production alternative over an unbalanced alternative that has a higher total revenue net of selling costs or a lower total cost of production. In effect, the proper deriva-

tion of the equal-sales contours in the sales function or of the equal-output contours in the production function shou' ! eliminate alternatives that were balanced but inefficient from consideration as these alternatives would lie beyond the specific contour for their sales or output level.

Fixed Plant

Plant facilities may be fixed either because of a time restriction or a capital restriction. In either case, the marketing staff is not involved, and there is no effect on the total-revenue-net-of-selling-costs curve. At each output level, the marketing staff can reach the desired programs and can achieve a balancing within those programs in that the marginal revenues net of selling costs can be equated for all of the firm-controlled marketing factors.

The production staff, however, finds that certain desired alternatives are ruled out and that they have to move from a long run cost function to a short run relationship where fixed factors are involved. The production staff should balance the variable inputs in the production mix by equating the marginal costs of the variable factors to each other, but only at one output level can these marginal costs be equated to the marginal cost of increasing the plant size.

At low output levels the marginal cost of the plant is higher than that of the variable factors—in such a situation, the production staff would prefer to use less plant and more of the variable factors if it were possible. At high output levels the marginal cost of the plant is lower than that of the variable factors, and here the production staff would prefer to increase the amount of plant in their production mix and reduce the amounts of the variable factors.

In putting marketing and production data together, top management should equate the marginal revenues net of selling costs of the controlled marketing factors to the marginal costs of the controlled production factors which are not fixed. Only if, by chance, this equality occurs at that one point where the marginal cost of the plant equals the marginal costs of the firm-controlled variable production factors, would all of the marginal values be equal.

Fixed Individual Budgets

Situations in which the marketing staff is given a fixed budget for one of the firm-controlled marketing factors are quite parallel in their impact on total revenue net of selling costs to the effect of a fixed plant on the production-cost relationship. A major difference does arise in that, in the case of a fixed plant, it is assumed that the plant size can neither be reduced nor increased, while in the case of fixed marketing budgets, it is generally acceptable to spend less than the fixed budget, if it should be advantageous to the firm to do so.[15]

Thus, at the lower output levels where the budget restriction is ineffective, the marketing staff can balance the marginal revenues net of selling costs for all marketing factors. At output levels where the budget restriction is effective, the marketing staff should equate the marginal values for the variable firm-controlled marketing factors to each other. At such levels, the factor restricted from increased use by the budget limitation has a marginal net revenue that is higher than the other controlled marketing factors. Thus, at these levels of output,

the marketing staff would, if permitted, find it desirable to increase the amount of the fixed-budget item and reduce the amounts of the variable items.

For example, if a budget limitation restricted advertising outlays to level A in Chart I, a horizontal line drawn through A would establish the range of choice open to the marketing staff. Note that once the budget restriction becomes effective, the marketing staff must resort to economically inefficient methods simply because the advertising outlay cannot be increased—i.e., given budget restriction A in Chart I, 600 units of sales can be reached only by using an economically inefficient combination of advertising and personal selling. Also note that—given the fixed advertising budget and the assumed levels of the other firm-controlled marketing factors—the firm in Chart I cannot realize 700 or more units of sales regardless of how much personal selling effort it stands ready to use.

Budget restrictions on marketing factors do not affect the production-cost relationship. When the marketing and production data are brought together by top management, the marginal revenues net of selling costs for all the controlled marketing factors not restricted by budget limitations should be equated to the marginal costs of the controlled production inputs. If this takes place at levels of output where the budget limitations are ineffective, a complete balancing both within and between the firm-controlled marketing and production factors can be achieved.

An expanded example of the budget restriction case is the situation in which the marketing staff is given a fixed total marketing budget with no limitations on how it might be used. Here the budget should be allocated among the controlled marketing factors so that the marginal revenues net of selling costs from all the budget restricted factors are equal. Price would probably be the only controlled marketing factor not affected by the budget restriction.

Thus, after the budget restriction begins to force the firm away from desired marketing alternatives, the marginal revenue net of selling costs for the price factor should be taken out of equality with the marginal values of the other controlled marketing factors. In the output range where the budget restriction is effective, the marginal revenues net of selling costs for the restricted factors should be equal to each other and larger than the marginal revenue net of selling costs for the price variable. Thus, at these output levels, the marketing staff would like to expand the use of the restricted factors and adjust price upward.

In reaching the decision on the level of output for the firm, top management should equate the marginal revenue net of selling costs for price to the marginal costs of the production inputs. If this equality occurs within the range of output where the budget restriction on the marketing staff is ineffective, the marginal revenues net of selling costs for the controlled marketing factors would all be equal to each other and to the marginal costs of the controlled production inputs.

Manipulation of the price factor may be restricted for the marketing staff through top management setting a minimum below which price cannot be lowered, a maximum above which price cannot be raised, or a specific

price that can neither be lowered nor raised. The latter case is similar to the fixed plant situation in production.

Given an unchangeable price, the marketing staff should equate the marginal revenues net of selling costs at each output level for all firm-controlled marketing factors other than price. Probably at one output level, at least, the price dictated by top management will be ideal so that, at that output level—or levels—the marginal revenues net of selling costs can be equated for all the firm-controlled marketing factors.

At levels of output below the latter point, the marginal revenue net of selling costs for the price factor is lower than that of the other firm-controlled marketing factors. In selling these outputs, the marketing staff would like to be able to raise price and increase the amounts used of the other controlled marketing factors.

At the levels of output above the point where all the marginal revenues net of selling costs are equal, the situation is just reversed—i.e., the marginal revenue net of selling costs for price is relatively high. Here the marketing staff would like to lower price and reduce the amounts used of the other controlled marketing factors.

The setting of price has no impact on the production-cost relationship. In putting marketing and production data together, top management should select that level of output which equates the marginal revenues net of selling costs for all the firm-controlled marketing factors except price to the marginal costs of all controlled production inputs. Only if this output level is also the point where the marketing program is in complete balance, would the firm be operated where all the marginal values of the firm-controlled factors were equal.

If the price set by top management is merely a minimum or maximum price, rather than an unchangeable price, the marketing staff can achieve balanced marketing programs for all output levels where the ideal price for the output level falls within the unrestricted ranges. If the solution to the level of output for the firm falls within this range of outputs, all firm-controlled factors would be balanced with their marginal revenues net of selling costs being equal to each other and to their marginal costs of production.

Fixed Quantity

Quantity, like price, can be fixed by top management through setting a minimum, a maximum, or a specific unchangeable level. If it is assumed that the fixed quantity level does not grow out of a restriction on any of the firm-controlled marketing or production factors, but rather reflects such desires of top management as (1) not growing beyond a certain point, (2) realizing some fixed percentage increase in sales, (3) achieving some stated share of the industry market, or (4) growing to some absolute size level, then the quantity restriction would have no impact on the total revenue net of selling costs relationship or on the production cost relationship. At all levels of output both the marketing and the production staffs would be able to achieve their desired balanced programs.

If output is to be at some unchangeable level, top management will find that the marginal revenues net of selling costs for the controlled marketing factors do not equal the marginal costs of the controlled production factors at the fixed level of output unless, by

chance, the fixed level of output falls just at the output level where the total equality occurred. If output is set in the sense of stating a minimum or a maximum quantity, marginal revenues net of selling costs for the controlled marketing factors can be equated to the marginal costs of the controlled production factors only if this equality occurs within the range of accepted quantity levels. If such is not the case, the chosen level of output must fall on the stated minimum or maximum quantity. In these situations, all marginal revenues net of selling costs should be equated for the controlled marketing factors and the marginal costs of production should be equated for the controlled production factors; however, the two groups—marginal revenues net of selling costs and marginal costs of production—would not be equated to each other.

Summary

Essentially, the marketing staff is viewed as having responsibility for maximizing total revenue net of selling costs for each level of output. Achieving the best possible combination of the controlled marketing factors at a particular output level requires that the revenue net of selling costs realized from the marginal effort expended on each of the controlled factors be equal, and that no feasible change in any one or any group of the controlled factors be able to improve the firm's total revenue net of selling costs for that output level.

Ideally, when top management chooses the particular combination of marketing and production programs for the firm, the marginal values of the firm-controlled factors on both the marketing and production sides of the firm should be equal so that the net contribution of the last dollar spent in any and all areas of the firm would be equal to zero.

Generally, the marketing staff is not given an entirely free hand in carrying out its responsibility, but rather finds itself confronted with restrictions on its choice among alternative marketing plans as a result of outside- and firm-imposed limitations on the actions it can take. Thus, the marketing staff may well find that the above conditions cannot be realized; yet, they are conditions which are to be pursued as far as possible.

If outside- or firm-imposed restrictions prevent either the marketing staff or the production staff from reaching otherwise desired alternatives at particular output levels, top management should pick the marketing and production combination which balances the marginal values for the unrestricted controlled marketing and production factors and which thereby equates the marginal contribution net of all costs for the unrestricted controlled factors to zero.[10]

In the process of evaluating specific manipulations of the firm-controlled marketing factors, allowance must be made for anticipated responses from those factors influenced but not controlled and for the impact of any such responses, in turn, on the outcome of the original manipulation of the controlled factors.

Furthermore, the marketing staff must incorporate into its evaluation of the alternative manipulations of the controlled factors, both the primary and secondary effects of the expected levels of those total revenue and/or selling cost influencing factors which are neither controlled nor influenced by the firm.

Data for Framework

It is well recognized that much of the data about the impacts and interrelationships of the various factors affecting total revenue net of selling costs are not known to the firm. Furthermore, it is recognized that some of these data cannot be objectively measured, while in the case of others, it is too costly in terms of time and money to measure them for the decision at hand either because the necessary time and money are not available to the firm or because, for the particular situation, the contribution of the objectively measured data is not deemed worth the cost of obtaining it.

What is maintained here is not that the marketing staff will have, or even will be able to secure, all the data demanded by the decision-making situation, but rather that (1) the decision must be made (if no action is taken, the implication is that it has been decided that inaction is the best course) and that (2) the final decision indirectly assigns a value, or at least a range of values, to all the unquantified variables involved.

Therefore, since the final decision can only be the correct solution under some set of assumed values for the unquantified variables; and since these unquantified variables will receive at least implied values, or ranges of value, through the final decision, it is best to attack the problem of estimating them head on.

The head-on approach has two merits. First, the estimating or "guesstimating" process used in the head-on approach at least rules out obviously impossible and highly improbable values for the unquantified variables, while such values might slip by undetected on an indirect assignment basis if a decision is reached by completely ignoring them.

Second, this approach will more clearly indicate the weaknesses in the quantitative estimates behind the decision so that significance of these weaknesses can be properly assessed in terms of their impact on the probability of a favorable outcome. In short, as its second contribution, the head-on approach makes the decision-maker more aware of when he is about to draw to an inside straight position.

Role of Framework

The role of the developed framework approach presented here is not to supply the answers to marketing problems, but rather to offer a consistent and reasonably inclusive frame of reference within which to search for the answers. The emphasis is on the nature of the problem, the wide range of variables, interrelationships among the variables which must be reckoned with, and the conditions that should be met.

Real-world decision-making situations may fall short of this framework for many reasons; yet, attempting to approximate the framework should result in improved marketing decisions through a more systematic and complete consideration of the variables involved, even though much of the evaluation is still done through executive judgment.

Thus, it is hoped that the presented framework has value as a tool for improving marketing decision-making. Furthermore, it is hoped that it conveys a better understanding of the marketing sector of the firm to individuals outside marketing, thereby fostering a more cooperative relationship between marketing and non-marketing groups.

Throughout this article an effort has been made to integrate the presented framework with the standard approach to production relationships. It is hoped that this not only makes the framework more palatable to the theorist but also contributes to a better appreciation of the process of making marketing decisions and to a better understanding of the interrelationships among the factors affecting total revenue net of selling costs.

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6. Total relationships are used throughout this paper rather than average relationships, because dealing with totals eliminates the danger of becoming engrossed with increasing profit per unit at the expense of total profits, and also because total relationships are one step closer to the underlying sales and production input data and to the concept of marginal increments than are average relationships. Selling costs are taken to include the costs associated with such activities as advertising, personal selling, physical distribution, and services. While variables such as product design and quality level are considered to be marketing variables in this paper, changes in such variables are treated as defining a new product with new revenue and cost functions. The costs associated with such changes would not be substracted from total revenue in getting the total-revenue-net-of-selling-costs curve but rather would be handled on the production side through a shift in the total-production-cost curve.

7. Examples of the latter are goals to (1) maintain—or increase to some stated level—the firm's share of the market, (2) avoid inciting aggressive action from competitors, (3) keep financial control of the firm in the hands of the present ownership, (4) secure some stated rate of sales increase, (5) achieve some particular industrial and/or social power position for the firm's management, (6) maintain some minimum level of employment, (7) continue the firm's position of a leader in new product development or in product quality, or (8) carry out some stated social welfare goal.

8. The predicted outcome of any plan has a degree of uncertainty, but for some plans the degree of uncertainty is greater than for others; thus, the weighing of alternative plans has to include some element of discounting for uncertainty.

9. The range of commitments affecting marketing activities is quite large, e.g., (1) inventories may be excessive or short; (2) certain facilities and equipment may be owned, while others may be under long term leases which may include some penalty clause if the agreement is cancelled; (3) critical positions are already staffed and lines of authority and responsibility are established; (4) production licensing agreements may be

in existence; and (5) channel agencies may claim certain territorial rights and may hold commitments from the firm involving some degree of specific marketing support.

10. A price reduction has a cost equal to the amount of the price reduction times the number of units that could have been sold at the higher price and a return equal to the increased number of units sold times the new price. A price increase has a cost equal to the reduction in units sold times the old price and a return equal to the amount of the price increase times the quantity sold at the new price level. If in the case of a price reduction, the firm must absorb losses on dealer inventories, or if in either case there are costs of changing price lists and catalogues or other costs associated with the price change, such costs would have to be allocated over time and charged against the expected return from the proposed price change.

11. The equal-cost lines are straight lines since dollars spent on advertising are a perfect substitute for dollars spent on personal selling as far as total expenditures are concerned—i.e., there is a constant dollar cost rate of substitution between advertising and personal selling. Changes in prices of inputs related to the quantity used could be accounted for through departing from straight equal-cost lines or through inserting several sets of straight equal-cost lines with different slopes and relating the equal-sales contours to the set of equal-cost lines appropriate to the quantity of inputs involved.

The equal-sales contours are illustrated as curved in a convex fashion toward the origin because advertising and personal selling are infrequently perfect substitutes for each other in their ability to create sales. For example, as marginal effort is transferred from advertising to personal selling, the marginal performance of the effort in advertising increases while that of personal selling decreases. Thus, if the total sales effectiveness is to be retained—i.e., if the firm is to stay on the same equal-sales contour—it will take larger and larger chunks of personal selling effort to balance reductions in advertising.

12. The result here is a function of both the situation and the variable(s) being considered—e.g., in certain situations advertising may have a range in which increasing returns occur.

13. Owing to the many variables having some effect on total revenue net of selling costs, it is difficult to generalize about just how the total-revenue-net-of-selling-costs curves would appear relative to each other. One would expect, however, to find that the highest segments at the low output levels were associated with relatively high prices while the highest segments at the high output levels were associated with relatively low prices.

14. Here, as throughout this discussion, it is assumed that at least one alternative yielding positive profits exists for the firm.

15. The marketing staff may, however, decide that it must expend its full budget—even though this means using an inefficient marketing program—in order to protect its long-run interest. For example, an excessive advertising budget may be fully expended simply because failure to do so may have an adverse impact on future requests for funds for advertising.

16. An alternative formulation would be to view the marketing staff as, in effect, the grand strategists of the firm operating within firm-imposed restrictions determined by top management. In such a perspective, the production staff would be required to submit the production cost data to the marketing staff. The marketing staff would then proceed to move directly to the maximum long-run profit strategy consistent with the outside- and firm-imposed restrictions. Here the marketing staff could somewhat restrict the range of output over which it did extensive evaluations of marketing alternatives. It could also by-pass the marginal revenue net of selling costs concept, and move directly to dealing with marginal contribution net of all cost for the controlled marketing factors.

IS INFLATION INEVITABLE?

W. L. Crum

There is no such thing as a little or "controlled" inflation and those who advocate it, often for selfish reasons, are playing with fire, this observer of the economic scene warns, and offers a plan to debunk the inflation Santa Claus myth and enlist the aid of honest citizens to halt the mounting price and wage spiral before it is too late.

Dr. Crum, Professor of Economics Emeritus at the Schools of Business Administration at the University of California, Berkeley, is an authority on business cycles and corporate and public finance. He has combined a distinguished teaching career (Yale, Harvard, Williams, Stanford, and University of California) with service as consultant to the United States Treasury, and as Director of the National Bureau of Economic Research. In addition he is the author of a large number of articles and books in the fields of economics and taxation. He first outlined his formula for curbing inflation, the subject of this article, as guest speaker at a dinner honoring participants in the Executive Education Program at Berkeley.

INFLATION is everybody's business. It affects every pocketbook, every dollar of savings or capital reserve, every purchase, every contract or other commitment involving a term of time, and, in the long run, every job. Therefore, the present and continuing threat of inflation in our economic affairs is vitally important to everyone and I shall discuss it not just in terms of its effect on business, but of its often disastrous impact on the welfare of our country and of citizens in general.

I have written the title of this article in question form because I have not found in the many discussions of inflation which I have examined any adequate treatment of a basic question of the highest practical importance. It is how and whether a successful fight can be waged against inflation in our present situation. This article is devoted to an examination of certain considerations which may help in finding an answer to that question.

Without, like a writer of whodunits, slyly keeping you in suspense until the end of this paper, I can answer the question "Is inflation inevitable?" now. Unless we devise and pursue in the fight against inflation a more intelligent and a more effective campaign than any so far tried or suggested, the answer is a simple Yes.

I say this for two main reasons. First, because inflation is not an inert and passive phenomenon, incapable of working toward its own persistence and growth. It is not like a bad dream, which shortly disappears as normal sleep is resumed; nor is it like an ordinary cold in the head which soon runs its course and leaves the victim with no permanent damage to health. Inflation does not quietly go away, merely because we lazily leave it alone. Instead, inflation, once initiated by our own foolish policies, is an active and virulent force, capable of sustaining its own life, of gaining strength as it continues, and of extending its destructive effects over a long time reaching perhaps to a disastrous climax. In short, inflation feeds upon itself.

Callous Promoters of Inflation

The second reason is that inflation is actively and powerfully promoted by various citizens and groups of citizens. We may concede that some of these sincerely believe that inflation, or what they optimistically call moderate inflation, is in the public interest, and particularly that it is an essential means for providing economic growth and high employment.

Others promote inflation for selfish reasons, either because they are shrewd enough to secure from it advantages for themselves, or because they imagine that advantages automatically come to them from inflation. I sometimes fear that those citizens actively favoring inflation constitute an effective majority of our body politic. They have certainly had their way repeatedly during my lifetime, and present prospects are that they will have their way again in the near future.

Even in my less pessimistic moments, I am confident that the fight against inflation is hopeless unless a majority, and preferably far more than a mere majority, of our citizens become convinced that inflation—even creeping inflation—is a public enemy.

The practical political task which we must accomplish is that of bringing a strong majority of our citizens into a continuing and intelligent fight against inflation. This involves not only awakening the many citizens who are now lazily indifferent to the problem, but

also winning away from their present allegiance large numbers of citizens who currently favor inflation. Let us therefore examine the task of building an effective political resistance to inflation, the obstacles in the way of accomplishing the task, and some possible ways for carrying it through to success.

Gradual Inflation a Delusion

We need at the start to clear up one source of confusion in public thinking. I refer to the allegation that gradual inflation—sometimes called moderate, or mild, or creeping inflation—is something entirely apart and totally different from acute, or wild, or galloping inflation—what I prefer to call catastrophic inflation.

This allegation is apparently an essential selling point for those who seek to promote and continue gradual inflation. They are fully aware that most citizens, and even they themselves, have a vague but terrifying mental picture of the economic and social devastation worked by catastrophic inflation. These advocates of moderate inflation must therefore convince the public that they are not preparing the way for catastrophic inflation, that the latter "can't happen here."

I regard all of this as dangerously false. All inflation is one disease, with moderate inflation its initial and temporarily tolerable stage, and catastrophic inflation its final, acute, and cataclysmic stage.

Here, as in much which I present as assertions in the paragraphs that follow, I cannot give all my supporting arguments, point out various qualifications, or indicate the contributing role of other factors. I must ask the reader to accept these assertions as my thoughtful interpretations of known facts, and as the careful opinions of a professional student who can easily make errors, but is unlikely to make gross errors.

Returning to my assertion that inflation is one disease, I know of no historical instance of a catastrophic inflation which was not preceded by a period of gradual inflation during which the people were lulled into a belief that it would never be more than gradual. In other words, catastrophic inflation is not a separate disease which strikes full-blown upon the stable and normal health of the economy.

I know of various historical instances in which a period of gradual inflation, billed by its advocates as temporary and subject to wise and effective control, was followed inexorably by the disaster of catastrophic inflation. Fortunately, this course of the disease, from gradual to catastrophic, is not inexorable in all cases; for the record shows a few instances in which the disease was cured before reaching the acute stage.

This part of the record affords some ground for lingering optimism that we can cure the present disease before it reaches the catastrophic stage. But this by no means implies that something short of a cure—such as attempts to confine inflation to a gradual process—will prevent the arrival of the acute stage. I find nothing in the record to indicate that the disease can be confined indefinitely to its gradual or creeping stage by any so-called controls.

Feeds on Itself

This is an appropriate point at which to comment on my earlier assertion that inflation feeds upon itself. A first reason is that the prospect of continuing inflation discourages saving. It

does so because prospective savers are somewhat aware that inflation erodes the purchasing power of savings invested in a wide range of assets.

In addition it does so because the mere fact of inflation, even an inflation generated by a deliberate policy which aims to hold the general price advance to about 2 or 3 percent per year, tends to speed up purchases which would be made later except for the fear of higher prices. Inflation is indeed the implacable enemy of saving and of savers.

A second reason appears in the effects of inflation on the incentive to incur debt: many people who might borrow less or not at all in the absence of inflation, are tempted by inflation to borrow now and pay back later in depreciated dollars. To be a debtor becomes smart. The developments reflected in these two reasons—the adverse effect of inflation on the incentive to save, and its stimulating effect on the incentive to borrow—both tend to intensify the inflation. This is because borrowing which is not supported by saving takes the form of bank credit, and an enlargement of bank credit is often inflationary.

I take up now a group of reasons of a somewhat different sort, because they are concerned less with the responses of individual citizens and more with the efforts to protect groups of citizens from the burdens of price inflation. For example, labor unions having strong bargaining power may secure a so-called escalator clause in wage contracts, which automatically lifts wages as cost of living rises.

Likewise, unions may seek arrangements by which privately financed pensions of their members will be increased in order to allow for reduced purchasing power of the dollar. More generally, the publicly financed social security benefits may be raised to take some account of the rising cost of living. Various other examples could be cited; they all have the same objective, to provide some relief from the burdens of price inflation for groups which have the bargaining power or the political influence to demand attention to their burdens.

I do not assert that all of these protective measures are invariably and necessarily inflationary, but I do say that they tend to be so. Even when the means of financing these measures is ostensibly non-inflationary, such financing tends to make drafts upon the income or savings of the economy, which would otherwise be used for normal consumption or for productive investment, and thus to induce indirectly the inflationary expansion of bank credit.

These protective measures tend strongly to exaggerate the existing inflation, and these effects plus the two reasons cited above help account for an almost irresistible tendency for an inflation, once initiated, to become progressively more intense.

Increasing Doses of Inflation

Apart from the foregoing somewhat automatic responses of citizens and groups of citizens to an existing inflation, which tend to cause an acceleration of the inflation, we must note one other important factor which often produces a like result. That factor is the fear of the advocates of inflation that the original dose of inflation was not strong enough to induce the allegedly desirable result, and their consequent insistence that a larger dosage is needed. I do not deny the possibility that, when business is depressed and many men and machines are idle, a

moderate dose of inflation may afford a stimulus to initiate recovery.

The vital question is whether the recovery, once initiated, can carry on by the operation of the normal economic forces favoring expansion. If the economic system is in normal good health, and particularly if the preceding depression has brought a cure for the main elements of ill health which shared in causing the depression, a natural recovery, unaided by further inflation, can carry on toward full activity. But the conditions favoring a natural recovery sometimes do not exist; and then, as the advocates of inflation see that the earlier doses have not been followed by full recovery, they loudly call for new and larger doses of inflation. This was the experience in the thirties. After the huge deficit financing of the early Roosevelt years we still had serious unemployment, and the advocates of deficit financing repeatedly complained "the government did not spend enough."

Playing With Fire

I have discussed at some length those factors which can easily develop a moderate inflation toward an acute inflation because I want to emphasize the difficulty of controlling an inflationary process and keeping it moderate. I do not say that anyone who tries to make us believe that a policy of creeping inflation can be pursued for a long and perhaps indefinite time without being followed by the galloping type of inflation is a liar.

What I do say is this: The unfolding history of the actual inflation under any such policy is very likely to make him look like a liar. One of the first tasks we must accomplish, in any intelligent fight against inflation, is to remove from the minds of citizens the dangerous delusion that persistent moderate inflation can be managed without danger of catastrophic inflation. Let us constantly remind ourselves that, if we play with small fires, we run a grave risk of bringing on a conflagration.

Complex Effects of Inflation

I now make certain other suggestions for the fight against inflation, and comment on some of the obstacles to be overcome. First, much of the current propaganda against inflation strikes me as wrongly conceived and largely a waste of effort. In particular, I think that continuing repetition of the allegation "Inflation hurts everybody" is useless and even harmful to the cause, since many citizens know or think they know from their own experience that this allegation is false.

To be sure, everyone feels burdened by the rising prices of things which he buys, but any thoughtful citizen knows that this is only one aspect of the impact of inflation on him. Other aspects may be or appear to be favorable to him; and in many cases these favorable effects may more than offset, apparently if not in fact, the advance in prices he must pay and various other adverse effects of inflation.

Before we can say that a citizen is hurt by inflation, we must weigh all of the effects, favorable as well as adverse, which inflation has on him. In attempting this, we must bear in mind that typically a citizen is a complex economic unit; he makes contact with any economic development such as inflation, not at a single point, but at several points. Inflation touches him not only in the rising prices of commodities which he buys, but also in various other ways. Some of these other contacts with inflation may be

very agreeable to him, so much so that he is willing to endure the rising prices which he pays. We cannot say he is hurt by inflation until we appraise the net effect of inflation upon him, with attention to all of his economic interests.

I do not catalogue all of these interests, but mention a few of the most important for our present purpose. In addition to being a purchaser of commodities, our citizen may be exposed to the effects of inflation in other ways. He may be a seller of commodities. He may earn wages or a salary. He may have savings, and may be a creditor with his savings invested in assets yielding a fixed income and having no significant chance of increase in principal. He may be a risk-taker with savings invested in assets yielding an uncertain return and having a capacity for large gains (or large losses) in value as compared with the original amount invested. He may be receiving a pension or look forward to receiving one at a later date. He may be a debtor. Not many citizens have all these interests, each of which involves an exposure to the effects of inflation. But nearly every citizen has at least one of these interests. A very large number have more than one, and at least a moderate number have most of these interests.

Benefits Debtors, Hurts Creditors

We may pause to consider some of the very few citizens who have only one of the interests (apart from the purchase of commodities) listed, or for whom that one interest is so clearly predominant as to override all others. The citizen who is exclusively a creditor is invariably hurt by inflation both in its effects upon the value of his money loaned and of its interest yield, and in its effects upon his purchases of commodities. A similar statement can be made about the pensioner, unless perhaps his pension is of the variable annuity type. The debtor is benefited by inflation, though the benefit may not adequately offset his burdens in buying commodities at rising prices.

For each of the others—the seller of commodities, the earner of wages or a salary, and the investor in equity assets—inflation may bring or appear to bring a benefit, and that benefit may exceed the burdens involved in buying commodities at rising prices. In each of these three cases, the favorable effects of inflation are at best uncertain, and depend on various circumstances more or less independent of inflation. In most of the foregoing cases—and these are the comparatively rare "simple" cases in which one interest is clearly dominant—some doubt exists as to whether the net effect of inflation is a burden or a benefit.

The doubt is even greater in the commoner case in which the citizen has two or more of the indicated interests in significant degree. Then the task of appraising the net effect of inflation upon such a citizen—of deciding whether he is hurt by inflation or the reverse—becomes even more difficult. But I think no doubt exists that numerous citizens do derive a net benefit from gradual inflation, and many others think they derive a net benefit. Even in catastrophic inflation some citizens, by acting shrewdly and timing their actions wisely, may secure a net benefit from an episode which is disastrous for their fellows. But these very few forestallers and sharpshooters, who can come through the cataclysm of acute inflation with advantage to themselves, are of no present concern to us: not only must we fail in any attempt to enlist them in the fight

against inflation, but also their number is too small to affect current policy.

Organizing Anti-Inflation Forces

I turn now to those we perhaps can enlist, and to the vital question of how to enlist them. We need not worry about those citizens whose sole or predominant economic interest is that of the creditor or the pensioner. They are already aware that they suffer a net penalty under inflation, even moderate inflation. They do not need to be awakened to fight inflation, though their effectiveness in the fight might be increased by better organization and leadership. But their total number is not a large fraction of our citizenry, and we must look elsewhere in order to build up a politically effective opposition to inflation.

I think the key to our success lies in a wording which I have repeatedly used—many citizens derive, or think they derive, a net benefit from inflation. I doubt that we shall enlist any significant number of those citizens who actually derive a net benefit unless we can effectively appeal to them in terms of motives which are not selfish.

But I am hopeful that, by sustained and intelligent effort, we can enlist the bulk of those who now think they derive a net benefit although in fact they suffer a net disadvantage. We must convince such citizens that they are in fact hurt by inflation.

Let us discuss one group of them, the wage-earners. This group is not only so very large that it has potentially decisive power in any political determination, including the determination of governmental policies which cause or permit inflation; but it also includes large organized subgroups which, under able and vigorous leadership, can and often do follow private policies which intensify and perhaps directly cause inflation.

Many leaders of organized labor, while constantly howling about high and rising prices and indignantly pointing an accusing finger at other groups as the culprits causing inflation, have persistently in recent years followed private policies and favored public policies which strongly promote inflation.

These leaders, fortified by various factors including the subservience of their henchmen, often exercise wellnigh autocratic power in the private policy of unions. In matters of private policy, reflected in union actions chiefly in the negotiation of wage contracts, the bargaining power of these leaders, especially when it is reinforced by the coercive power of friendly public officials, is so vast that they can with little effective restraint insist upon wage scales and other contract terms which have or tend to have inflationary results.

In matters of governmental policy, they seek to mobilize—although fortunately they are not fully successful in this effort—their own members in political support of candidates generally favoring union-sponsored programs which often promote inflation. In addition, they often exert strong influence in the same direction upon legislators and public administrators by threatening reprisals at the polls and by creating an impression that their capacity to develop unified political action by their membership and even among non-member wage-earners, for whom such leaders often profess to speak, is much higher than in fact it is.

I see little hope that these dominant leaders of organized labor can be won over to the fight against inflation.

Either they are already fully convinced that inflation—they would, of course, say gradual inflation—is desirable in their interests and those of their members and perhaps the general public; or they are willing to tolerate inflation as a means facilitating, and perhaps essential to, the achievement of their own objectives and those of their unions.

Debunking a Myth

But I do have high hopes that we can enlist as opponents of inflation many members of unions and many wage-earners who are not members. In this task we must overcome a major obstacle. That is the belief, which many of them now hold, that inflation has brought and will continue to bring to them a net benefit.

Many of these people have enjoyed an improving standard of living during recent inflationary years. While they object to and complain about the rising cost of living, their dollar wages have risen faster, with the result that their real wages have advanced. This is not true for all wage-earners; but it is emphatically true for the members, except the unemployed members, of those unions having strong bargaining power, and it is true to some extent for members of some less powerful unions and for some non-member wage-earners.

We should not be surprised when these people draw the easy inference that inflation has caused this improvement in their welfare, particularly when they see their own leaders and professed spokesmen apparently endorsing inflationary policies. The blunt fact is that these people, in the absence of any effective presentation to them of arguments setting forth other causes and explanations of their improving welfare, quite naturally conclude that inflation is the cause or at least an essential facilitating circumstance.

A primary task in any effective fight against inflation is accordingly that of convincing a huge number of wage-earners that their recent gains in welfare are fully explained by causes other than inflation. I cannot here undertake to identify all these causes or to outline the evidence supporting the conclusion that these causes, and not inflation, account fully for recent increases in the real wages of many wage-earners. I am convinced that these increases are mainly due to the introduction of new products and the opening up of new industries resulting from the great recent acceleration in the advance of science and technology, to the remarkable increase in the efficiency of industrial management, and above all to the continual improvement in industrial productivity.

Note that I use the term industrial productivity, not productivity of labor. The reason is that, since what is generally called productivity happens to be measured as output per unit of labor time, some people lazily infer that productivity increases are created by and belong to labor; whereas I feel certain that almost all of any gain in industrial productivity arises from improving efficiency of management and especially from continuing new investment of capital.

Teach Economic Facts of Life

Whether we can get these ideas into the minds of those who work for wages remains to be seen; but, unless we do accomplish this, and use for that purpose more effective and intelligent educational effort than has thus far come to my notice, we shall not have taken the most essential step toward defeating inflation. We are aiming here at

the most politically powerful group, albeit not entirely cohesive group, within the nation.

Unless and until we can convince this group that their gains in welfare are adequately explained by other causes, many members of the group will continue to believe that such gains are dependent upon inflation. To present this case in a convincing manner will require great skill and patience, for the arguments must rest firmly upon sound analysis of economic relationships which are somewhat intricate; and those arguments must be set forth in forms which make sense to the wage-earner group, and must be repeated patiently until they overcome existing prejudices to the contrary.

That such prejudices exist cannot be doubted by any thoughtful observer. Various leaders of organized labor and other spokesmen and so-called friends of labor have over many years planted in the minds of wage-earners the beliefs that their gains can come only from the exercise of collective bargaining power, that gains made by powerful unions tend also to bring like gains for weak unions and even for the non-organized group, that improvements in industrial productivity belong to labor or can at least properly be seized by labor, and that wage bargains which so increase costs as to threaten loss of markets and reduction in employment are possible without these results if appropriate governmental policies—usually inflationary policies—are followed. Dislodging these prejudices can not be accomplished quickly, but we should be aware of the prejudices, as we design and carry forward the propaganda intended to convince wage-earners that their gains in welfare arise from causes other than inflation.

Appeal to Nobler Motives

Thus far I have discussed the fight against inflation in terms of selfish interests of citizens and groups of citizens. I believe that this approach is warranted because selfish motives play a large and often dominant part in all political actions. This is so much the case that I do not think any attempt to fight inflation without giving adequate attention to the diverse selfish motives of various citizens and groups can possibly succeed.

Nevertheless, some political actions of at least some citizens are determined by nobler motives; and in some instances these motives prevail even at the cost of sacrificing selfish advantages. Chief among these are the altruistic desire to protect other citizens or groups from the unfair penalties of inflation, and a patriotic devotion to the welfare of the nation as a whole. That these and like motives play some part in the political decisions of many citizens, and a decisive part for a smaller number of citizens, cannot be doubted. But they are generally overwhelmed by the decisions of the great number of citizens actuated chiefly by selfish motives, and this fact is the reason for my contention that any fight against inflation which appeals solely to unselfish motives cannot succeed. Nevertheless some help, and perhaps very powerful help, in the fight against inflation can be enlisted by an appeal to these nobler motives.

Inflation Does Not Make Jobs

What needs to be done in order to insure that such an appeal will have even limited success? The first essential step is a convincing destruction of the argument, so forth with increasing insistence by inflationists, that infla-

tion—at least mild inflation—is needed to remove the suffering of wide unemployment and to insure the economic growth vital for national welfare and security.

So long as altruistic and patriotic citizens believe in this argument, they will be reluctant to fight inflation and may even take political actions promoting inflation. We must therefore destroy the argument; and this, like the task I described above of convincing wage-earners that their gains in welfare are not caused by inflation, will require patient and intelligent educational effort.

"Inflation—Enemy of Saving"

We must convince these people that economic growth, and the important long-run reduction in unemployment which growth facilitates, depend upon the accumulation of savings and the investment of savings in productive enterprise; and we must constantly repeat that inflation is the deadly enemy of saving.

By "productive enterprise," I mean primarily private enterprise; for, while I reluctantly admit that some so-called "investment" by public authorities can be productive, I insist that much of public expenditure is merely a form of collective consumption and is often less desirable consumption than individual citizens would choose for themselves. I further insist that even when government operations are productive they are generally less efficient and more wasteful than those of the private sector.

It Will Take Time

I said "long-run reduction in unemployment" to emphasize a formidable obstacle facing our counter argument; the beneficial results of a non-inflationary program do not appear tomorrow or next month, but develop gradually over several and perhaps many years of persistent application of the program. The inflationists, on the contrary, can proudly point to the benefit, or at least the apparent benefit, allegedly derived from inflation almost immediately. Our people have an unfortunate tendency, confirmed by countless episodes in our history, to make their political decisions with reference to short-run, instead of long-run, considerations. The professional politician is well aware of this tendency, and his campaign promises almost invariably reflect that awareness. In the fight against inflation we must overcome that tendency, for all the vital parts of our argument are in terms of long-run consequences. I see a hopeful sign in the fact that various professional politicians now condescend to talk about economic growth; for growth, if it means anything, means a development reaching beyond this month or this year.

The New Era Delusion

A second step essential to the destruction of the inflationist argument is the removal of the popular delusion that the present situation in this country is a new era, to which we cannot apply the lessons of history in our own and other countries. History affords abundant examples of inflations which did not produce sustained economic growth, and of vigorous growths in the absence of inflation. But people who are unwilling to learn from the experience of others are always prone to regard the situation in which they live and the problems which they confront as somehow different from those which have gone before, and such people

often deny that history affords any proper analogy.

How far we shall get in disabusing them of this delusion, I do not know; but we must make the effort, and one means may consist in showing that people who deliberately embarked on certain earlier inflations also imagined that theirs was a new era. If we cite the historical record, we must be ready for the sneering charge that we belong to the horse-and-buggy days. I am not here to defend those days, but I did observe that we were then able to tell from a distance which was the front end of a vehicle, and that we knew whether we were going forward or backward, which is more than some present political drivers know.

I cannot now undertake to outline various other steps needed in countering the inflationist argument. I have said enough to show that successful counter argument is a difficult task, and that our appeal even to those unselfish citizens actuated by patriotic and altruistic motives involves a soundly conceived and persistent educational effort.

Wide Reach of Patriotic Appeal

The foregoing appeal is not designed to be aimed at the limited number of citizens actuated solely by unselfish motives. A far greater number of citizens are to some extent influenced by unselfish motives, even though they also respond, and perhaps primarily, to selfish motives. And I also insist that an effective appeal on such a high ground as patriotism needs to be made by leaders with clean hands.

The public readily spots the hypocrisy of the industrialist who makes a vehement speech against inflationary government spending, and then pulls all available strings to secure a government contract for his company. Or the journalist who publishes a scathing editorial against wasteful federal expenditures, and then flies with other irate citizens to Washington to protest an economy move which closes a shipyard in his community. Or the congressman who rants against inflation on the floor of the House, and then wires the newspapers in his district that he personally has arranged that the government will dredge a deep-water channel to the county seat.

Such behavior cannot be condoned by the cynical remark that, as the money is going to be spent anyway, "we might as well get some of it for our community and our company." The truth is that some of the money would not be spent anyway, but is being spent because the legislative log-rolling process almost inevitably leads to increased expenditures. This process brings some balance among the outlays for various localities and other special interests, yet it usually does so not by cutting back some such outlays, but by increasing others.

This tendency is exemplified by a statement Jack Garner is reported to have made in his days in the Congress: "If New England gets a ham, Texas is going to get a whole hog." The hypocrites and the cynics may be useful in the ranks of the anti-inflationary army, but they will not help much as recruiting officers or by being out in front as regimental color bearers.

I remain hopeful that some real strength can be added to the forces opposed to inflation by convincing various citizens who have been deriving net advantages from inflation that these advantages should be sacrificed in the public interest. Such

people may, if we approach them skilfully, conclude that their private advantage is less important than protection of the welfare of their fellow citizens and preservation of the nation's financial soundness.

Few of us would soil our hands and scorch our souls by having any part, despite the opportunities for profit, in the narcotics traffic. Let us hope that many citizens will come to have the same attitude toward inflation, which is the narcotic of economic life. Let us hope that each of these, in the hush before each day's activities begin, will make this solemn pledge: Even at the cost of sacrificing personal advantage, I will not this day take any avoidable action which might add fuel to the devouring flames of inflation.

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Professor Frederic Meyers
California Management Review
Graduate School of Business Administration
University of California
Los Angeles 24, California

Professor David A. Alhadeff
California Management Review
Graduate School of Business Administration
University of California
Berkeley 4, California

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